

**Gilazhov E.G.**

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The seventh book of Selected Works, presented to readers, by the academician of the Kazakhstan National Academy of Natural Sciences, doctor of technical sciences Gilazhov Esengali Gilazhovich includes part of the research work, basic concepts on environmental problems, and compiling a list of measures to protect the environment and protect the air basin, water, soil, flora, fauna, bowels, historical and cultural monuments of this region.

The book is designed for a wide range of scientists involved in environmental management issues, as well as students, graduate students studying courses in ecology and nature conservation.

The reader is also offered the questions of educating the population and the main directions of environmental research.

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**STATE OF THE ENVIRONMENT OF THE NORTHERN CASPIAN SEA  
AND NORTHERN PART OF THE ATYRAU OBLAST AND  
ENHANCEMENT MEASURES**

With Diarov M.D. and Mulikov P.P.

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## **Part 2**

### **State of environment of the northern part of Atyrau oblast**

## **2. State of environment of the northern part of Atyrau oblast**

Makhmet, Inder, Kyzylkogolin regions are situated in the northern part of Atyrau oblast. Its major part is occupied by a large sand massif called Ryn-sands. Agriculture is the main industry of Makhambet region, due to its close location to the industrial centre (the town of Atyrau).

Inder region, with its variety of natural resources, is important for the development of the chemical industry, extraction of salt and the production of building materials. Huge deposits of boron, potassium-magnesium salts, cooking salt and raps of high concentrations are found here.

The oil industry employ the largest number of people in the region, the second place in this respect belongs to the food industry and to agriculture.

Kyzylkok region is situated in the north-eastern part of Atyrau oblast and borders on Western-Kazakhstan oblast in the north and Aktubinsk oblast in the north-east.

The main producer in the economy of the region is agricultural production. Other industries are less well developed here; the Kinarmunai oil-extracting enterprise and the joint venture "Matin" have performed small-scale works on oil extraction in the past two years.

The gravest environmental situation is on the territory of the Toisoigan testing grounds, with an area of 750 thousand hectares.

In the northern part of Atyrau oblast there are some explored oil and gas deposits, but so far they have not been well developed.

The greatest concern to people in the region is the environmental and climatic state of the territory, as well as the state of technical progress, its inappropriate use and the exploitation of resources, which destroys the habitats of people, flora and fauna traditionally adapted to the difficult climatic and geographic conditions of the area, and by low standards of infrastructure and medical services, which significantly decreases the ability of people and all other living beings to adapt to change and the loss of the old ways.

### **2.1.1. State of environment of Makhambet region**

#### **2.1.1. Outline**

Makhambet region is situated in the central part of Atyrau oblast and borders on Inder region in the north, Makat and Kyzylkogolin regions in the east, Isatai region in the west, and the town of Atyrau in the south.

The region occupies an area of 961,9 thousand hectares, or 8,2% of the oblast territory. The administrative centre of the region is Makhambet settlement, located 68 km from the oblast centre. Connection with the oblast centre, the town of Atyrau, is through the Atyrau-Uralsk national motorway. The total length of the automobile roads within the region is 372,2 km, out of which:

- international roads -67 km;

- national roads – 251 km;
- oblast roads – 22,6 km;
- local roads – 14, 6 km;
- roads of inner economic importance – 17 km.

95,4% of roads of general use with a total length of 372,2 km have surfacing; the roads of inner economic use have no surfacing.

The region is characterized by intensive methods of economic development, the leading industry of which is agriculture.

The close proximity to the industrial centre (the town of Atyrau) has defined the character of agricultural development as suburban. Products of agriculture are sent to processing enterprises, trade centers and storage premises of Atyrau and the region. The traditional system of driving(nomadic)-pasture livestock breeding, which cause migration and concentration of livestock all over the territory, has formed the current settlement of the population of the region. Along with the permanent centers, temporary settlements, such as winter and summer quarters, have been developed. The technology of the nomadic livestock breeding will preserve its specialization in the future.

After coming out of state use and privatization of the agriculture, the former state farms were reorganized and 320 farming economic units and the cooperatives “Ak-Zhaiyk” and “Mura” were formed, which so far have not been intensively developed, except for “Pervomai” JSC.

The industries are mainly geared to supplying the population with vegetable and milk products (“Pervomai” JSC); there is also a printing industry (a printing house), and a timber industry, (supplying population with firewood and wooden products).

Associations with limited liability and private enterprises provide transport, trade, small scale building and some other services. State enterprises perform postal and veterinary services. Northern Baklaniy is the only oil-field of the region, and it has been developed by “Gural” LLP.

The main air polluting enterprises in Makhambet region are NRS-Atyrau AGU, NPS-Kapmanova, KS “Zhiyktransgas” “Redut”; other polluting sources are thermal-power objects in the settlements and exhaust fumes from vehicles.

Some technogenic load and contamination of the soils of the region are caused by the following factors: the railway transport of Atyrau-Astrakhan and Makhambet-Alexander Gai;

automobile transport occupies an area of 1134 hectares; the Middle Asia-Centre gas pipeline (58 hectares); Uzen-Samara (44 hectares), Mangyshlak-Astrakhan (133 hectares), AHY 989) oil pipelines and the Bolshoi Chagan-Atyrau gas and oil condensation pipeline, which is under construction.

The area of Makhambet region in the geo-morphological respect belongs to the Near-Caspian accumulative upper-quarter marine, occasionally, alluvial depression of the edge-concave platform with preserved marine salinity and partial aolic model-making. Its relief is represented by a flat valley, formed mainly by sandy and loamy upper-khvalynsk and in the north-east clay.

Along the river Ural there are alluvial valleys. The river flood area has a great number of flat and wide lowlands and branches of the river. On both sides of the river Ural there are terraces; their width fluctuates from 1 to 8 km. Numerous saline lands, sors and takyr are found in the north-eastern part. The absolute heights fluctuate within -25 m below sea level.

The intersection of the territory with ravine-gorge net is 0,04 km/km<sup>2</sup>, the depth of the local erosion bases is 16 m, average inclines of water-collectors are less than 1 degree.

On the whole, the relief of the region is suitable for pasture livestock breeding, and in the flood area of the river Ural for irrigation farming.

The location of the region in the Euro-Asian continent defines the climate as being continental with short, not snowy but rather cold winters and hot long summers. According to "Agro-climatic resources of Guriev and Mangyshlak oblast of KazSSR (Gidrometeoizdat, Leningrad, 1978), the region belongs to the 2a (the Topoli meteo-station) very dry hot agro-climatic area.

The amount of precipitation during the period of vegetation is 70-115 mm, and the annual total is 150-180 mm. This signifies a low moisture supply, the hydro-thermal coefficient does not exceed the level of 0,2-0,3. The possible waste of moisture for evaporation during the vegetation period is 1105-2285 mm and the air moisture deficit is 7,8 mb.

Large thermal resources, high evaporation in combination with an extreme lack of moisture, especially, in the warm period of the year, hinder the development of bogar farming. But with the irrigation of lands it is possible to create favorable conditions for the growth of many warm-climatic cultures (corn, vegetable, melon, fruit and berries).

In the hydro-geological respect, Makhambet region is situated in the south of a vast Near-Caspian artesian basin, and occupies part of the delta of the river Ural and the central line of the Caspian Sea. The valley relief and the desert climate in combination with complicated non-structural conditions of the territory, which were the sea bottom in the past define to a great extent the lack of underground waters suitable for economic-domestic supply of the settlements. Fresh and slightly salty waters here are connected only with the upper part of the quarter deposits; they lie on limited area in the form of rare lenses, "flowing" on salty ones. The prognosed resources are very insignificant and are not a subject for calculation.

Water-bearing minerals are clay sands, mainly of fine and thin-grained structure, with supeses and loams. Their capacity in the river valley is 7-10 meters, and along the river flood areas are between 3-5 meters. Depth to the water occurrence is 1-5 meters, on the upper terraces 7 meters.

The minerals have low filter characteristics, which worsen the quality of subsoil waters. Consumption of the wells rarely exceeds 0,1-0,3 l/sec., and that of the boring wells 1,0 l/sec., sometimes more. Mineralization of the water is various, but is generally 5-10 g/l. Fresh and slightly salty waters adjoin the river flood areas and large branches and are followed in the form of narrow intermittent lanes and separate lenses. These waters are not everywhere and in insignificant amounts are used for water supply of small settlements (farms, wintering quarters and some

economic units, sometimes farms with the requirement of 0,5-5 l/s, up to 10 l/s). Thus, for the water supply to Redut, Saichik, Sorochi, Tanka, Zhalgansai, Ortakshil settlements and auls #8, 11, 15, situated in the valley of the river Ural, some lenses of fresh water have been explored in the near river flood area (Didichin, 1979). Capacity of the lenses is 2,5-8,5 m, their area is 1,2-9,5 km<sup>2</sup>; consumption of bore hole water is 0,1-0,8 l/s. The stated need for water, which is equal to 5-10 l/sec. for every settlement, can be satisfied through the use of wells. In the period of flooding, mineralized waters of the valley become fresh-influenced for a short period of time, and are used more extensively for economic needs, water supply of the livestock and in some places for drinking. Depth of the wells is 10-12 m, and that of boreholes is 20-25 meters.

Slightly salty and salt waters with a mineralization of 10-30 g/l over are spread across the remaining part of the region, in the middle-quarter khvalynsk, alluvial-delta and modern new-Caspian deposits, selectively used only as drinking water for livestock.

Resources of the surface waters are represented on the territory by the river Ural, which flows from the north to the south of the region; the river valley in this part is not clearly expressed. The river flood area is two-sided, meadow, 25 m wide. The river bed is 100-125 m wide, and has a number of islands and islets. The river flood area is two-sided, meadow, with a depth of 25 meters. The riverbed is meandering, 100-125 m wide and has a lot of islands and small isles. The river belongs to the snow-fed type of rivers; its flow is formed, basically, in the upper parts of the river. The water carrying capacity undergoes great changes every year. About 80% of the annual flow is carried by the river Ural in the period of spring flooding (IV-VII); and in the water period (XII-III) is carried only about 8%. In the spring the riverbed undergoes some deformation, due to washing tens of meters of land off the river banks. With the medium height of flooding (5-6), the water passes along the main riverbed and its lower flood area; with the water rise to 9-11 meters, the upper flood area of the river and its adjacent lands are inundated. A number of settlements, situated on the river banks, experience spring flooding. The delta of the river Ural starts from its branch called Narynka, in the lower parts of their river some other branches, namely, Baksai, Black river and others come off. Small branches are filled with water only in the full-flowing periods. A few stations were built and the riverbeds of the branches were widened in some parts for constant water abundance. Capacity of the head canals is 17-25 m<sup>3</sup>/ sec. The above mentioned branches, as well as Kursai, Teren-Uzek, 7-Aul canals serve mainly for watering of pastures.

The peculiar feature of the soil surface of Makhambet region is the extremely expressed complexity of inter-zonal soils (river flood area-meadow, meadow salty, salty lands, saline lands). Soils of the region have a small humus content, a comparatively small capacity of the horizon and low content of elements of the ash feed.

Predominance of xerophilic semi-bushes is characteristic of the vegetative surface of the region.

The most common pastures in the valley are wormwood. Pastures of this group are formed on brown-grayish soils. The group is represented by white land-ebelek, wormwood-itsigek, wormwood-saline types. White land and Lerhovskiy wormwood predominate here.

Opposite-leaf Klimakoptera, hard-fruit galimoknemis and cone-like sveda subdominate.

Wormwood pastures are situated in the lowlands and river flood area on meadow-marsh, river flood area-meadow soils. White land and Lerhovskiy wormwood prevail. The pastures are used intensively, which has led to the appearance of weed and harmful vegetation, such as ebelek, mortuk, dodartsia, zhantak and gorchak. Wormwood pastures are rationally used in the spring-summer-autumn period.

Analysis of the modern state of the vegetative surface shows that a tendency to depression of vegetation has been noted, due intensive use of the land. Constant and careless grazing of livestock near the wintering quarters sharply decreases the production characteristics of the lands and leads to their choking with weed, harmful and in some places poisonous grasses, such as adraspan and molochai).

The fauna of Makhambet region is represented by steppe, semi-desert and desert biosenoses: mammals – saiga, bear, wolf, korsak, red fox, steppe polecat, hare, gopher; birds – goose, duck, chirok, snipe, pigeons, lysucha, grey grouse; fish – sheat-fish, pike, pike-perch, wild carp, bream, yaz, crusian, perch, roach and others.

The study of the rich cultural heritage of the region has only begun, but its important role in formation of national traditions, spiritual life and culture of the people of Kazakhstan is already clearly recognized. There are many monuments in Makhambet region; they differ by their type, artistic expression and unique character.

On the whole, there are 183 historic and cultural monuments in Makhambet region. These include monuments to the soldiers who died in the Civil war in 1922, monuments to Egorov and Tolstov, the first Chairman of Redut Regional Soviet D. Fedin (1922), a grave of the Hero of the Soviet Union Kontsev (1980), and a plaque to commemorate the crossing of the river Zhiyk by Isatai and Makhambet (1837). There is also an obelisk to the soldiers-countrymen in Makhambet settlement, monuments to the soldiers who took part in World war II (1975) and to participants in the Civil war (Sarichik settlement, 1967).

The Archeological monuments are the Sarichik settlement of the 9th-14th centuries, 1,5 km from the modern Sarichik settlement, a Neolithic camp-site and a burial-mound #1 of the bronze and iron age, 150 km to the left of the Atyrau-Uralsk motorway.

The architectural monuments are the Altyn necropolis, a kulpytas, the mausoleum of Uspenbai, and the Kenzhaly necropolis.

An important aspect of modern town-building development is the consideration for the preservation of historic monuments, and the material and spiritual culture of the people.

### 2.1.2 State of the air basin

High air mobility causes intensive airing and decreases the occurrence of stagnative situations, when pollutants of cold and low emissions from industries and vehicles are accumulated in large amounts.

Monthly average repetition of weather with still and weak winds (to 4 m/sec.) makes 10-15%. Near-land inversions of the air temperatures, which hinder the air exchange in the near-land layer are very rare in the warm period of the year, and in the winter period, despite their repetition of 40-70%, are observed mainly at night, when the intensity of the air pollution is minimum during the day.

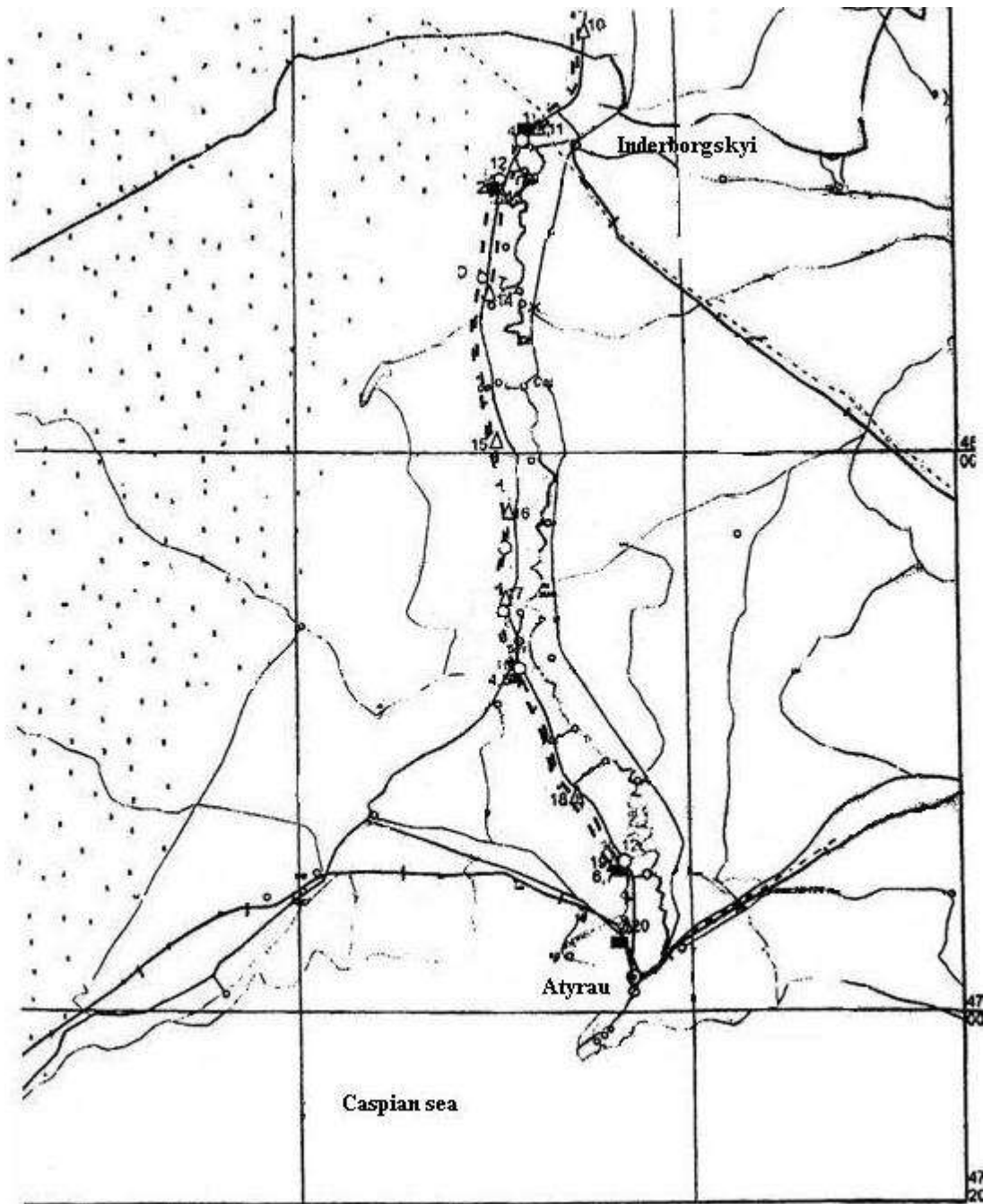
Thus, the climatic conditions of Makhambet region can provide enough purity of the air basin given the rational placement of polluting sources and strict norms of emissions.

The main sources of anthropogenic pollution of the air basin of Makhambet region are KS "Redut", "Zhaiyktrasgas, NRS-Atyrau ANU, NRS-Karmanova ANU, "Gural" LLP (Northern Baklaniy) (Table 2.1.1). Among them the major source of pollution is KS "Redut" "Zhaiyktrasgas".

The air basin of Makhambet region at present has become cleaner than in 1995-1997, due to a number of reforms in the social and economic structures of the region. Many centralized boiler-works, which burn mazut and stove fuel do not operate now, as 6 state farms and some economic units were dismissed and as a result central heating of the settlements was stopped. The positive factor is that since 2000 natural gas has been used in Makhambet and other settlements, which decreases emissions of hydrocarbon ingredients into the atmosphere.

Nevertheless, an increase of air pollution is expected, due to construction of the Bolshoi Chagan-Atyrau oil and gas condensation pipeline that will cross all the territory of the region from north to south (Figure 2.1.1). The dates of the beginning of the construction have been planned for March 1, 2001 and the end for June 30, 2002. The OVOS project (October 13, 2000, Atyrau) has been worked out by "Mekensak" LLP for evaluation of the influence of the equipment for evaluation of the influence of the equipment used during construction works and exploitation of the condensation pipeline, the inventory of the polluting sources with regards of the duration of the construction works was made, and the total volume as well as individual emissions were calculated. It was cleared out that the polluting sources were of both stationary and movable character, from the automobile transport, as well as welding devices used at welding works

An exact plan of the work camp and the content of the object will be known after use of the building contractor. In the current project, approximate calculations of emissions from the equipment of a typical camp on the basis of project requirements have been made. It was necessary in order to evaluate the degree of potential influence of the work camp and prepare recommendations on compiling of the camp equipment and choice of its location.



- Single-track railways, stations, railway junctions.
- Motorway with improved surface
- - - - - The projected oil pipeline
- - - - - Gas pipeline

**Figure 2.1.1 Map-scheme of the construction of Bolshoi Chagan-Atyrau oil-condensation pipeline in Atyrau oblast (NR Centre “Mekensak” LLP, Almaty, 2000)**

Stationary sources of air pollution during the construction works are the following production objects of the basic field camp:

- Diesel generator with a capacity of 250 kW (2 generators);
- Storage premises;
- Fuel-distributing columns;
- Parking place for the automobile transport;
- Welding apparatus in the repair shop;
- Lathe and sharpening machines;
- Accumulative division.

Calculation results of the emission from separate sources are presented in Table 2.1.2.

Consolidated Table 2.1.3 shows the summary of polluting substances from the objects of the field camp. The total amount of emissions from the stationary sources of the field camp is

142,38 tons per year.

Table 2.1.1

**Indicators of the share of pollutants from the stationary sources in  
Makhambet region in 1995-1997**

##	List of nature-utilizing enterprises	PDV	VSV	Including data on ingredients										
				Nitric oxides	carbon oxides CO	Sulphur anhidrid	Hydro-carbons benzene	Hard substances (soot, ash, dust)	Hydrogen sulfide	Ammonia	Phenol/ksilol	Benzo Piren, benzol	Hydro carbons, previous	others
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						<b>1995</b>								
1.	State farm "Ural" "Embamunaigas" SC	14,19	-	3,57	4,86	0,42	3,44	-	-	-	-	-	-	0,01
2.	Makhambet PDEU	109,3	-	0,05	0,01	0,17	-	-	-	-	-	-	-	-
3.	"Atyraukurylus" SC, boiler-works of Makhmbetsettlement	90,53	-	3,63	10,1	14,4	-	-	-	-	-	-	-	-
4.	"Zhaiykransgas" KC Redut.	845,5	-	6-7,6	203,5	-	34,4	-	-	-	-	-	-	-
5.	Makhmbet repair-technical enterprise	23,2	-	3,0	11,65	8,18	-	-	-	-	-	-	-	-
6.	Boiler-works of Zhalgansaisettlement	12,65	-	2,46	7,42	0,06	2,7	-	-	-	-	-	-	-
7.	Boiler-works of regional communication unit of Makhambet	46,5	-	1,81	5,2	7,2	-	-	-	-	-	-	-	-
8.	PMK-4, Makhambet settlement	9,3	-	0,97	3,84	2,94	-	-	-	-	-	-	-	-
9.	State-farm "Gurievsky" State-farm aksaisky" State-farm 1 <sup>st</sup> of May	44,0	-	2,98	14,96	13,1	0,09	-	-	-	-	-	-	-
10.	Selection station	22,96	-	8,13	3,31	1,38	1,39	-	-	-	-	-	-	-
11.	Makhambet MPKX	45,93	-	1,47	18,91	6,98	0,22	-	-	-	-	-	-	0,11
12.		14,87	-	5,2	4,59	0,83	3,04	-	-	-	-	-	-	-
13.		66,73	-	3,67	10,99	12,11	0,36	-	-	-	-	-	-	-

Table 2.1.1 continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	1.State farm “Ural” “EMG” SC	14,19	-	3,57	4,862	<b>1996</b> 0,422	<u>3,448</u> 0,0016	Other Dust 1,73; Soot0,104	<u>0,03</u>	-	-	-	-	0,0673
2.	“Zhiyktransgas” KC “Redut”	-	1124,515	nitrogen oxide	412,78	-	-	-	-	-	-	-	169,11	0,907
3.	Makhambet agriculturalmachinery	23,2	-	541,71	11,56	8,18	-	0,36	-	-	-	-	-	-
4.	Makhmbet PKK	158,26	-	3,0	21,09	26,51	0,36	103,0	-	-	-	-	-	-
5.	Boiler-works of Zhalgansai settlem.	12,65	-	7,3	7,42	0,06	2,7	-	-	-	-	-	-	-
6.	PMK-4 Makhambet	9,047	-	2,46	3,848	2,94	-	1,287	-	-	-	-	-	-
7.	Economic unit “Gurievsky”	44,0	-	0,972	14,961	13,109	0,0916	12,87	-	-	-	-	-	-
8.	EU “Baksaisky”	22,96	-	2,986	3,31	1,39	1,40	8,74	-	-	-	-	-	-
9.	EU “1 <sup>st</sup> of May”	45,93	-	8,128	18,91	6,98	0,22	18,33	-	-	-	-	-	-
10.	Selection station	14,77	-	1,47	4,59	0,83	3,04	1,107	-	-	-	-	-	-
11.	Canal administration	16,454	-	5,2	8,235	5,88	-	0,3	-	-	-	-	-	-
12.	Anti-plague department Regional veterinary	18,96	-	2,03	7,92	5,5	--	2,0	-	-	-	-	-	-
13.	laboratory EU”Zauralsky”	5,52	-	3,535	0,63	0,86	-	3,81	-	-	-	-	-	-
14.	“Anura” SC (XXI Party Congress)	14,27	-	0,22	2,747	1,753	-	8,26 0,672	-	-	-	-	-	0,11 -
15.	“Atyrau Zholdary” SC Makhambet PDY	15,947	-	1,51	8,588	6,585	-	4,2614 32,3	-	-	-	-	-	-
16.	Boiler-works regional communication point	4,4944	-	0,02 0,05	0,013 5,2	0,17 7,2	-	-	-	-	-	-	-	-
17.	ofMakhambet.	46,5	-	1,81	-	-	-	-	-	-	-	-	-	-

Table 2.1.1 continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
18.	“Atyraukurylys” SC boiler-works of Makhambet settlement.	90,53	-	3,63	10,1	14,4	-	63,4					-	-
19.	State farm Akzhaiyk”	<b>No</b>	<b>limit</b>	<b>for</b>	<b>projec</b>	<b>t PDV</b>	<b>and per</b>	<b>misson</b>	-	-	-	-	-	-
20.	CPTY-10	15,145		1,941	7,563	5,39	-	0,242	-	-	-	-	-	-
21.	Shonaev school	8,533	-	0,726	2,0	2,88	-	2,972						
22.	BHY “Karmanova”	37,035		2,95	4,462	22,025	0,163	2,972					4,462	0,0008
23.	Makhambet ZHKK	11,061	-	1,82	6,48	2,63	0,088	0,043					-	-
						<b>1997</b>								
1.	State farm “Ural”		-	3,57	4,86	0,42	3,45	1,83	0,03				-	0,03
2.	AO “EMG” Redut” KC “Zhiyktransgas”			541,71	412,79	-	169,11	-	-				-	0,91
3.	Makhambet enterprise “Agroteknika” Administration HYYBC			3,003	11,65	8,185	3,777	10,863	-				-	1,693
4.	HPC-Atyrau BHY CHP-Karmanova bhy		-	2,03	8,24	5,88	-	0,3	-				-	-
5.	Makhambet EU		-	40,344	55,763	141,14	1553,2	19,784	9,784				-	25,09
6.	Boiler-works of Zhalgansai settlement		-	2,95	4,462	22,025	0,163	2,972					4,462	-
7.	Boiler-works PMK-4 Production cooperative		-	1,82	6,48	2,63	0,09	0,04					-	-
8.	Gurievsky “Baksai” SC		-	2,46	7,42	0,06	2,8	-					-	0,1
9.	“Birinshi May” SC Anti-plague department		-	0,97	3,85	2,94	-	1,29					-	-
10.	Selection station			2,99	14,96	13,11	0,09	12,85					-	-
11.	Cooperative “Mura”			8,13	3,31	1,39	1,4	8,73					-	-
12.	Cooperative “Ortakshil”			1,47	18,91	6,98	0,22	18,35					-	-
13.	Cooperative “Akzhalyk”			3,54	7,92	5,5	-	2,0					-	0,007
14.	CP “Gural” (Northern Baklaniy)			5,2	4,59	0,83	3,04	1,11					-	-
15.	“Atyraukurylys” SC			0,02	8,588	6,5855	-	0,672					-	-
16.	CPTY # 10 Shonaev school			1,51	2,74	1,753	-	8,26					-	-
17.				0,701	3,8941	-	0,624	0,2772					-	1,6
18.				1,903	7,935	1,207	51,931	0,47					-	0,19
19.				3,62	10,0	14,0	-	63,0					-	-
20.				-	-	-	-	-					-	15,145
21.				-	-	-	-	-					-	8,55



Table 2.1.2

**Parameters of polluting emissions into the atmosphere from the sources of the basic field camp during construction of the oil condensation pipeline (2001-2002)**

Industry. Source of emission		Hours of work per year	Name of emission source	Height of the source	Diameter of the pipe mouth, m; or width of source	Parameters of the gas-air mixture at the outcome of the source of emission			Name of the pollutant	Emissions of the pollutants	
Name	Amount					Speed, m/s	Volume, m <sup>3</sup> /s	Temperature degrees °C		g/s	t/g
DES	2	8760	Pipe	6	0,4	7,76	0,9749	150	Nitric oxide Nitric dioxide Carbon oxide Hydrocarbons Sulphur dioxide Soot Akrolin	1,4354 1,1042 0,9201 0,4417 0,368 0,184 0,0442	45,27 34,82 29,02 13,93 11,6 5,8 1,39
Welding apparatus	1	1040	pipe	2	0,2	2	0,0628	20	Weighed substances Iron oxide Manganese and its compounds Hydrogen fluorine	0,002673 0,0024 0,000267 0,00097	0,01 0,085 0,001 0,003
Sharpening-bench	1	1040	pipe	2	0,2	2	0,0628	20	Abrasive dust	0,111	0,416
Lathe	1	1560	pipe	2	0,2	2	0,0628	20	Oil aerosol Emulsion aerosol	0,0055 0,000175	0,031 0,001
Accumulative shop	1	150	pipe	2	0,2	2	0,0628	20	Vapors of sulphur acid	0,0042	0,0025
Automobile parking lot	1	4800	unlimited	2	0,2	2	0,0628	29	Carbon oxide Nitrogen dioxide Carbohydrites Sulphur dioxide Soot Benzopiren	0,0008 0,00032 0,00024 0,00016 0,00012 0,25 10 <sup>-8</sup>	0,01385 0,0055 0,00415 0,0027 0,00218 0,432 10 <sup>-7</sup>

Table 2.1.3

**Consolidated table of polluting emissions in the atmosphere from the objects  
of the field camp (2001-2002)**

Name of pollutant	MPC, OBUV, mg/m <sup>3</sup>	Danger rate	Emission of the pollutant, ton/year	Share of input, %
Nitrogen oxide	0,04	3	45,27	31,76
Nitrogen dioxide	0,085	3	34,82554	24,43
Hydrogen oxide	5	4	29,03385	20,37
Sulphur dioxide	0,5	3	11,60277	8,14
Soot	0,15	3	5,80218	4,07
Akrolain	0,03	2	1,39	0,97
Hydrocarbons	1	4	14,14288	9,92
Weighed substances	9,15	3	0,011	0,007
Hydrogen fluorine	0,02	2	0,003	0,0002
Dust non-organic	0,15	3	0,416	0,29
Oil aerosol	0,05	-	0,031	0,02
Emulsion aerosol	0,05	-	0,001	0,007
Sulphur acid vapor	0,3	2	0,00225	0,0015
Total:			142,52763	

During the construction works 400 units of automobile transport and construction machinery, which use diesel fuel, will be involved. The calculated fuel consumption is 30 liters per day for 1 transport unit or 3690 tons per year.

Emissions of harmful substances from automobile transport were calculated according to the methods of evaluated payments for air pollution by vehicles PHD 211.1.03.01-96. The results of the calculations on emission of pollutants from automobile transport are shown in Table 2.1.4.

Table 2.1.4

**Consolidated table of polluting emissions from automobile transport (2001-2002)**

Name of pollutant	Amount of polluting emissions, ton, Burning of 1 ton of diesel fuel	Annual emission of pollutant, ton/year	Share of input
Hydrogen oxide	0,047	173,43	38,65
Nitrogen oxides	0,033	121,77	27,14
Hydrogen carbons	0,0109	70,11	15,62
Sulphur dioxide	0,01	36,9	8,22
Soot	0,0092	33,95	7,56
Anhydrides	0,0034	12,55	2,8
Benzopiren	0,1410 (-6)	0,00052	0,0001
Total:		224,352	100,0

During the construction of the pipeline welding works will be carried out with 410000 junctions.

Emissions during the semi-automatic welding of steel will total:

- weighed substances – 10,96 tons;

including:

- iron oxide – 9,35 tons;

- manganese and its compounds – 0, 043 tons;

- nitrogen fluoride – 0,28 tons.

Total: 11,24 tons.

The results of calculations of polluting emissions from welding works are shown in Table 2.1.5.

Table 2.1.5

**Consolidated table of polluting emissions from welding works (2001-2002)**

Name of ingredients	MPC m.p., mg/m <sup>3</sup>	MPC c.c, mg/m <sup>3</sup>	Danger rate	Annual emission of a pollutant, ton/year
Iron oxides	-	0,004	3	9,35
Manganese compounds	0,01	0,001	2	0,43
Hydrogen fluoride	0,02	0,0005	2	0,28
Total:				11,24

Polluting emissions in the atmosphere from automobile transport will total 224,352 tons/year. Emissions from welding works on the line will total 11,24 tons per year. The total emissions from vehicles have been calculated as 235,592 tons per year.

Tables 2.1.6- 2.1.7 show the parameters of the sources of polluting emissions in the atmosphere. Two variants of boiler-works of NRS “Bolshoi Chagan” and NRS “Atyrau”, which use diesel fuel, were under study.

The qualitative and quantitative content of the air pollutants from the stationary sources are shown in Table 2.1.8.

The table stipulates that the largest amount of polluting emissions in the atmosphere were observed at NRS “Atyrau”.

Table 2.1.6

**Parameters of polluting emissions in the atmosphere from the source of Atyrau (boiler-works on natural gas), 2001-2002**

Production. Source of polluting emissions		Number of work hours per year	Polluting source	Height of the source, m	Diameter of pipe mouth, m; width of the flat source	Parameters gas and air mixture at the outcome of the emission source			Name of pollutant	Emissions of polluting substances	
Name	number					Speed m/s	Volume, m <sup>3</sup> /s	Temperature, degree °C		g/s	t/g
Boiler-works	1	3600	pipe	10	0,4	5,2	0,6567	140	Carbon oxide Nitrogen dioxide	2,57762 0,558	6,067 2,1235
Technological pumps	2	8400	pipe	6	0,1	16,73	0,1532	50	Hydrocarbons of oil	0,0454	0,137
Reservoir of oil and condensator	1	8640	pipe	10	0,2	0,92	0,029	30	Hydrocarbons Of oil	6,245	197,0
Chamber for receiving scraper	1	8400	pipe	2	0,006	0,5	0,0014	27	Hydrocarbons of oil	0,003	0,0934
Close drainage capacity 6m <sup>3</sup>	1	8400	pipe	2	0,01	0,5	4 10 <sup>-5</sup>	24	Hydrocarbons of oil	0,000072	0,0022
Locking bolt	1	8400	pipe	2	0,01	0,5	4 10 <sup>-6</sup>		Hydrocarbons of oil	0,000012	0,0001
Reservoir of oil and condensator	1	8400	pipe	10	0,2	0,92	0,029	30	Hydrocarbons of oil	6,245	197,0

Table 2.1.7

**Parameters of polluting emissions in the atmosphere from the source of Atyrau (boiler-works on natural gas), 2001-2002**

Production. Source of polluting emissions		Number of work hours per year	Polluting source	Height of the source, m	Diameter of pipe mouth, m; width of the flat source	Parameters gas and air mixture at the outcome of the emission source			Name of pollutant	Emissions of polluting substances	
Name	number					Speed m/s	Volume, m <sup>3</sup> /s	Temperature, degree °C		g/s	t/g
Boiler-works	1	3600	pipe	10	0,4	5,2	0,6567	140	Carbon oxide Nitrogen dioxide Sulphur dioxide Soot	2,57762 0,558 0,7005 0,0237	81,244 17,597 22,09 0,749
Technological pumps	2	8400	pipe	6	0,1	16,73	0,1532	50	Hydrocarbons of oil	0,0454	0,137
Reservoir of oil and condensator	1	8640	pipe	10	0,2	0,92	0,029	30	Hydrocarbons Of oil	6,245	197,0
Chamber for receiving scraper	1	8400	pipe	2	0,006	0,5	0,0014	27	Hydrocarbons of oil	0,003	0,0934
Close drainage capacity 6m <sup>3</sup>	1	8400	pipe	2	0,01	0,5	4 10 <sup>-5</sup>	24	Hydrocarbons of oil	0,00007 2	0,0022
Locking bolt	1	8400	pipe	2	0,01	0,5	4 10 <sup>-6</sup>		Hydrocarbons of oil	0,00001 2	0,0072
Reservoir of oil and condensator	1	8400	pipe	10	0,2	0,92	0,029	30	Hydrocarbons of oil	6,245	197,0

**The qualitative and quantitative content of polluting emissions in the atmosphere from the stationary sources (2001-2002)**

Source of polluting emissions	Number	Type of source	Name of pollutant	Emissions of pollutants, ton/year
Boiler-works on natural gas	1	<b>HPC Bolshoi</b> Pipe	<b>Chagan</b> Carbon oxide	1,652
Technological pumps	2	Pipe	Nitrogen dioxide	0,555
Supporting pumps	2	Pipe	Oil hydrocarbons	1,39
Chamber of launching of the scraper		Non-organic	Oil hydrocarbons	0,093
Reservoir of diesel fuel, 80 m <sup>3</sup>	1	Non-organic	Oil hydrocarbons	0,1955
Closed drainage capacity, 6 m <sup>3</sup>	1	Non-organic	Oil hydrocarbons	0,0022
Total:				5,277
		<b>HPC Atyrau</b>		
Boiler-works on natural gas	1	Pipe	Carbon oxide	6,067
Technological pumps	2	Pipe	Nitrogen dioxide	2,1235
Reservoir of trade products, 27500 m <sup>3</sup>	2	Non-organic	Oil hydrocarbons	0,137
Chamber of receiving the scraper	1	Non-organic	Oil hydrocarbons	394,0
Closed drainage capacity 6m <sup>3</sup>	1	Non-organic	Oil hydrocarbons	0,093
Total:				0,0022
Locks along the condensation pipe line	20	Non-organic	Oil hydrocarbons	402,422
Total:				0,0072
				407,706

Table 2.1.9 shows the input/contribution of the main sources of the air pollution.

At NRS Bolshoi Chagan the main source of the air pollution is the boiler works. If diesel fuel is used instead of gas for heating the emissions will increase significantly and will be (tons/year):

soot – 0,749, sulphur dioxide – 22,09, carbon oxide – 81,244, nitrogen dioxide – 17,597.

At NRS Atyrau the main input/consumption in the air pollution is made by the reserve park for trade products: 2 volumes of 275000 m<sup>3</sup>. Boiler-works, which use natural gas, make a lesser contribution to the air pollution than those on diesel fuel. Along the condensation pipe emissions of hydrocarbons of oil (oil benzene) through loose joints in the locking steel framework/reinforcement were noted.

The list of pollutants emitted into the atmosphere from the stationary sources with the specified MPC and danger rate is shown in Table 2.1.10.

Table 2.1.9

**Contribution of the main air polluting sources**

Sources of pollution	Emissions of pollutants, ton/year	Share of input, %
<b>HPC Bolshoi Chagan</b>		
Boiler-works on natural gas	2,207	41,82
Technological and supportive pumps	2,78	52,68
The chamber of launching and receiving the scraper	0,093	1,76
Reservoir of diesel fuel, 80 m <sup>3</sup>	0,1955	3,7
Closed drainage capacity, 6 m <sup>3</sup>	0,0022	0,04
Total:	5,277	100
<b>HPC Atyrau</b>		
Boiler-works on natural gas	8,1905	2,0035
Technological pumps	0,137	0,03
Reservoir of trade products, 27500 m <sup>3</sup>	394,0	97,9
Chamber of receiving of the scraper	0,093	0,023
Closed drainage capacity, 6m <sup>3</sup>	0,0022	0,00054
Locks along the condensation line	0,0072	0,0018
Total:	402,429	100

Table 2.1.10

**List of pollutants emitted into the atmosphere**

Name of pollutant	MPC m.p. mg/m	Danger rate	Emission of pollutant, ton/year	Share of pollutant, %
<b>HPC Bolshoi Chagan</b>				
Carbon oxide	5	4	1,652	31,306
Nitrogen dioxide	0,085	3	0,555	10,52
Hydrocarbons of oil	5	4	3,0707	58,19
Total			5,277	100
<b>HPC Atyrau</b>				
Hydrocarbons of oil	5	4	394,2322	97,96
Carbon oxide	5	4	6,067	1,507
Nitrogen dioxide	0,085	3	2,1235	0,53
<b>Locks along the condensation pipeline</b>				
Hydrocarbons of oil	5	4	0,0072	0,0018
Total:			402,429	100
Total:			407,706	

At the NRS Bolshoi Chagan the main pollutant are carbon oxide, sulphur dioxide and nitrogen dioxide. At NRS “Atyrau” the main pollutants of the air basin are hydrocarbons of oil.

Thus, in addition to carbon dioxide (CO<sub>2</sub>) and water vapors, the presence of sulphur dioxide SO<sub>2</sub> (the synonym is sulphur anhydride), carbon monoxide CO (carbon oxide), nitrogen dioxide NO<sub>2</sub> and soot (elementary carbon) has been noted in exhaust fumes from vehicles and gas emissions from the stationary oil and gas production enterprises of Makhambet region.

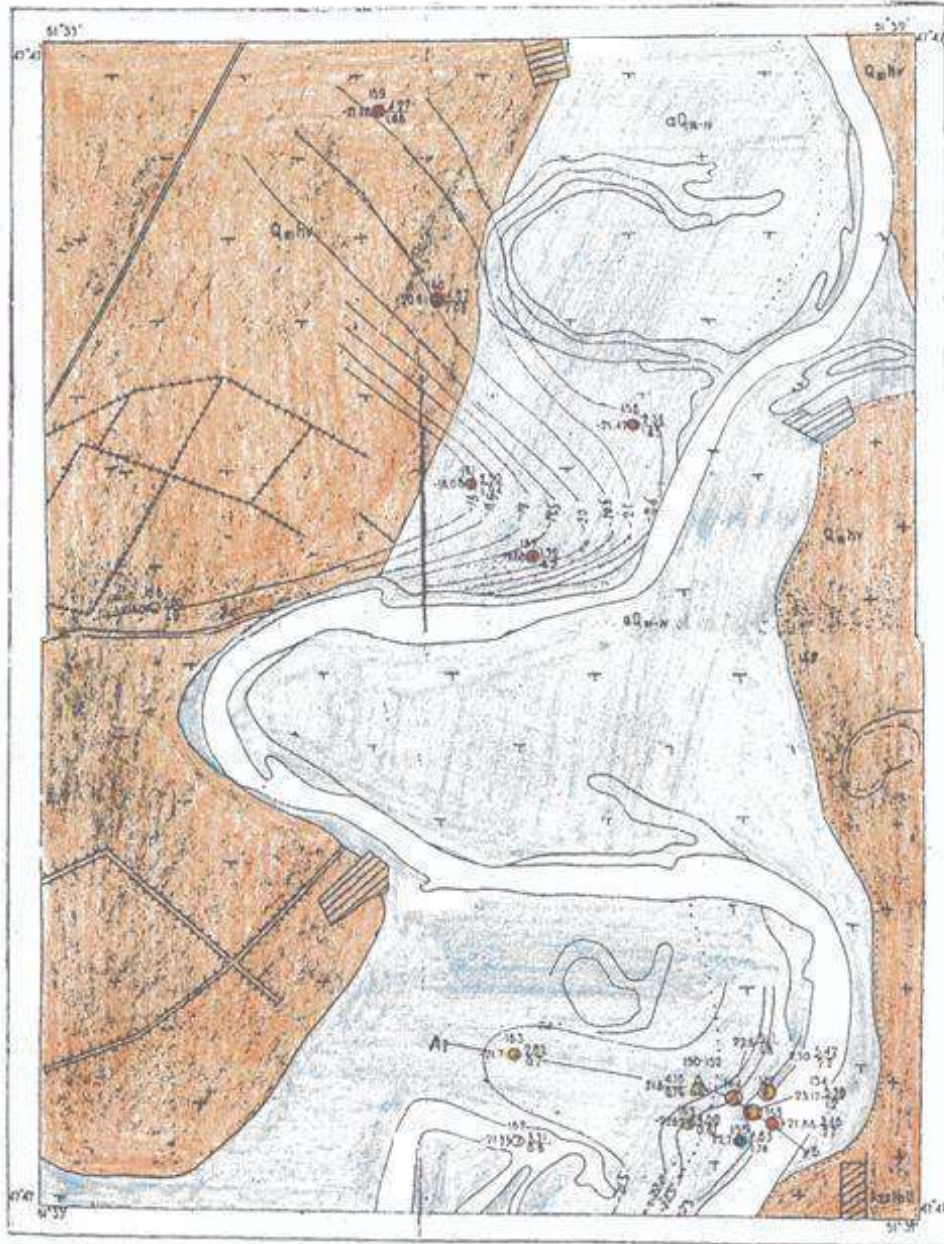
### 2.1.3. Surface and underground waters

The river Ural flows from the north to the south in Makhambet region; the river valley has no clear outline. The river flood area is two-sided, meadow, with a depth of 25 meters. The riverbed is meandering, 100-125 m wide and has a lot of islands and small isles. The river belongs to the snow fed type of rivers; its flow is formed, basically, in the upper parts of the river. The water carrying capacity undergoes great changes every year. The studies show that the most shallow year was 1937, with the capacity of 2,86 km<sup>3</sup> per year, and the most full-flowing was 1946 with 21,0 km<sup>3</sup>. About 80% of the annual flow is carried by the river Ural during the period of spring flooding (IV-VII); and in the water period (XII-III) only about 8% is carried. In the spring the riverbed undergoes some deformation, due to washing tens of meters of land off the river banks. With the medium height of flooding (5-6), the water passes along the main riverbed and its lower flood area; with the water rise to 9-11 meters, the upper flood area of the river and its adjusting lands are inundated. A number of settlements, situated on the river banks, experience spring flooding. The delta of the river Ural starts from its branch called Narynka, in the lower parts of their river there are some other branches, namely Baksai, Black river and others. Small branches are filled with water only in the full-flowing periods. A few stations were built and the riverbeds of the branches were widened in some parts for constant water abundance. The capacity of the head canals is 17-25 m<sup>3</sup>/s. The above mentioned branches, as well as Kursai, Teren-Uzek, 7-Aul canals serve mainly for watering of pastures.

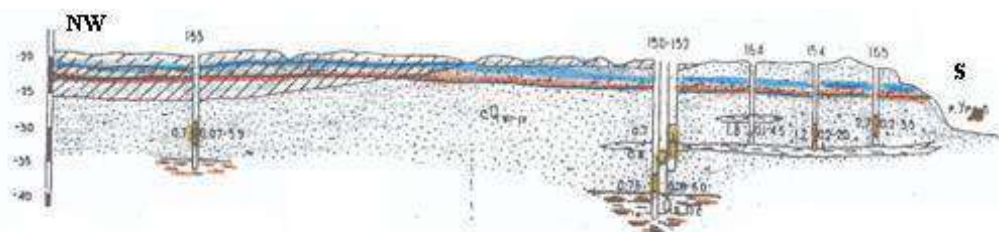
The region is situated in the south of the Near-Caspian artesian basin, part of the delta of the river Ural and the coastal area of the Caspian Sea. The flat relief and the desert climate, along with complex geostructural conditions of the territory, which used to be a sea bottom in the past define, to a great extent, lack of underground waters suitable for economic and drinking needs. Fresh and slightly salty waters are found here only in the upper-quarter deposits, they occupy a limited area and are found in the form of rare lenses of small capacities, “flowing” on the top of salty waters. Their prognosis resources are very insignificant and are not the subject for calculation.

Below is given a short description of the subsoil waters of alluvial quarter deposits in the river Ural valley, which have a limited use (according to the Kazakh Hydrogeology department) (Figure 2.1.2). Water-carrying are clay sands, which are mostly of fine and thin-grained character with supeses and loams. Their capacity in the river valley reaches 7-10 meters, and along the river flood area is 3-5 meters.

**Figure 2.1.2 Hydrogeological map of Makhambet post  
Scale 1:25000**



**Hydrogeological section on line A-B  
Scales: vertical 1:500, horizontal 1:100000**



## Conventional symbols

### 1. Aquifer distribution



Basal water of recent quaternary alluvial deposits;

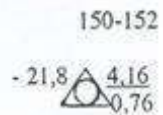


Basal water of recent novokaspijskij deposits; sand, clay loam

### 2. Wells

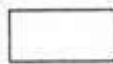


Observation well. Figures atop are the numbers of a well. On the left is absolute mark of water level, m. On the right in the numerator is depth of water level, m on August, 30, 1990; in the denominator is water mineralization, mg/dm<sup>3</sup>. the color shows the type of chemical composition of underground water.



Hydrochemical well cluster. Symbols are the same.

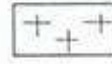
### 3. Mineralization and chemical composition of water



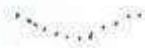
till 1 g/dm<sup>3</sup>



1-3 g/dm<sup>3</sup>



>3 g/dm<sup>3</sup>



Different mineralization water boundary



Chloride based



2 component chloride sulphate



2 component chloride bicarbonate



Mixed 3 component

### 4. Direction of underground water stream

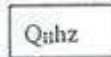


Direction of underground water stream

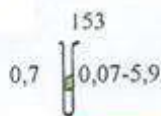


Hydroisohypses of the first to the surface of aquifer on August 30, 1990

### 5. In the section



Water-resisting deposits of khazarskij level, clay



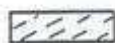
Observation well. Figures atop are numbers on the map. Color matches with the chemical composition of groundwaters. Figures on the left are mineralization, g/dm<sup>3</sup>. on the right the first digit is discharge, l/sec, the second is lowering

Prevernal minimal level of ground waters in 1995



Maximum level of ground waters in the period of flood in 1995

### 6. Matrix lithology



Sand loam



Clay loam



Clay

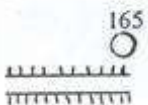


Shelly sand

### 7. Additional signs



Line of hydrogeological section



Well needs to be redrilled



Well needs to be cleaned



Irrigation ditch

The depth to the water occurrence is 1-5 meters, and in the upper terraces is 7 meters. The minerals have low filter characteristics that worsen the water quality. Consumption of the water from wells rarely exceeds 0,1-0,3 l/sec, and that of boring wells is 1,0 l/sec, sometimes more. Mineralization of the water varies, the most frequent is that of 5-10 g/l. Fresh and slightly salty waters adjoin the river flood areas and large branches, and they are found in the form of narrow intermittent lenses or separate lenses.

These waters are used for domestic water-supply in limited amounts; they are used for agriculture, winter quarters, some economic units and, occasionally, state farms with a requirement of 0,5-5 l/sec., rarely 10 l/sec. For instance, for water-supply of Redut, Saichik, Sorochi, Tanka, Zhalgansai, Ortakshil settlements and Auls # 8, 11, 15, situated in the river Ural valley, some lenses of fresh waters have been explored in the near-river flood area (Didichin, 1979). The depth of the lenses is 2,5-8,5 meters, their area is 1,2-5 km<sup>2</sup>; consumption of the water from boring wells is 0,1-0,8 l/s. The stipulated water requirement, which is equal to 5-10 l/sec. for every settlement, indicates the need for shared wells. In the flood period the valley's mineralized waters are briefly influenced by fresh waters and are used more extensively for economic needs, for watering livestock and, in some places, for drinking. The depth of the wells is 10-12 meters, and that of boring wells is 20-25 meters.

On the remaining territory of the region, slightly salty waters with mineralization of 10-30 g/l and more are spread in the middle-quarter khvalynsk, alluvial-delta and modern new-Caspian deposits; they are used as drinking water for livestock.

Thus, the whole area of the region is poorly supplied by underground waters. Use of distilling structures is hindered, due to very high concentrations of salts in underground waters and the low water-extraction characteristics of minerals. The gravest situation with the water-supply is in the south of the region, in the coastal part of the Caspian Sea, where the underground waters are very salty.

As the only possible and reliable source of water-supply for the economic needs of settlements, the surface waters of the river Ural can be recommended. The Makhambet regional centre uses water from the river Ural for economic and drinking needs. Besides, underground waters with the capacity of 1,81 l/sec. have been explored in the river flood area of the valley.

#### **2.1.4. State of the depths and the geological environment**

Makhambet region is situated in the southern part of the Near-Caspian lowland. Its relief is represented by a sloping valley of marine origin, steeply inclined to the Caspian Sea. The absolute heights of the valley are negative, in the north they are from -7-8 meters, and in the south are -27-28 meters. In some place the surface of this valley is separated by erosion depressions with a flat bottom and inclined slopes, 5-6 meters deep. In the western part of the region this valley is crossed by the mouth part of the river Ural, which can be divided into river flood

and terrace levels, of 2-5 m and 6-8- m respectively. Some sandy hillocks, ridges and staritses of various forms have been observed in the river flood area; the terrace surface is even and slightly wavy, smoothly developing into the seaside valleys. In the southern part of the region below the mark of -25,5 meters can be observed in the form of separate lots the modern (New-Caspian) valley with flat, heavily saline surface, which is periodically inundated by the sea to the height of -28,0 meters.

The surface of the region is covered everywhere by quarter deposits of the second half of this period: upper-quarter (khvalynsk) and modern (New-Caspian). Deposits of the khvalynsk level are mainly of the marine or, occasionally, of river character. They are represented by supeses, loams, sands and clays, often interlaid and developing into each other. Capacity of the deposits is 10-15 meters.

The New-Caspian deposits also well marine and river supeses and loams, occasionally salty, with capacities of about 2 meters; they lie on the khvalynsk thick layer. The described deposits e are under laid everywhere by lower and middle-quarter deposits (bakinsk and khvalynsk levels); they have been uncovered by boring wells. These deposits contain thin-grained clay sands, loams and clays with the depth of 20-30 meters. In the lower parts, various deposits, from Neogenic to Paleogenic, have been uncovered by boring wells. The upper-Paleozoic deposits, which lie in the depth of the first thousands of meters, are represented by a very thick saline-gypsum layer.

The structural and tectonic peculiarities of the region are defined by its location in the centre of a deep concave Near-Caspian depression and saline-domed tectonic characteristics, influenced by the presence of a saline-gypsum thick layer in the significant depths. These deposits, which experience pressure from the upper layers, are found in the plastic form and are able to rise. The result of this rise is the formation of saline domes, which elevate some ancient minerals to the surface. The oil and gas bearing capacities of the Near-Caspian depression are connected with its saline tectonic qualities.

In Makhambet region there are no mineral resources which can be used for any economic pupose. In the geological respect, it has no potential for fuel and building materials which could be of use to the regional industries.

The following oil-fields have been developed in Makhambet region: the Daraimola oil-field in the southern part of Near-Caspian depression (since 1994). The elevated layer, which contains the oil-field, is a saline-domed structure of a disguised uncovered character. The over-saline deposits have been divided into southern, eastern and north-western wings by systematic bursting breaches/disturbances. The amplitude of throws reaches 450 meters. The wings are formed by deposits of chalk, urs, and trias, which form semi-domed structures. The structural plan of the chalk and urs are identical. The wings of the structure are divided into fields by the plumage-like throws. The amplitude of the productive fold along the roofing-collectors exceeds 120 meters. The height of the deposits is 19 and 26 meters, the medium effective thickness is 13 and 32 meters, and that of the oil-containing is 7,3 and 10,7 meters; the sizes of traps are 0,6x2.1 km.

The most productive are sandstones and alluvialites of the middle and lower Ural, which lie in the depth of 461-480 meters and 486-524 meters. The collectors are terrigenous minerals with open porosity of 18,2-19 % and permeability of 0,0016 mkm<sup>2</sup>. Piles of hard clays serve as covers. The oil-bearing capacity of the collectors is 54 and 80 %. According to the character of the reservoir, the deposits are stratus cone-like, tectonically screened. The water-oil contacts are observed at the marks of 491,5 m and 522,5 m. The initial layer pressures and the temperature in the horizons are 5,3-5,6 MPa and 35 degrees C. The oil debit of the middle-Jurassic deposit does not exceed 7 m<sup>3</sup>/day on 3 mm shuttler. Its density is 903 kg/m<sup>3</sup>. The oil has a sulphur content of 0,54 %, a paraffin content of 2,97 %, and it is highly resinous. The content of silicogenic resins and asphaltogenic substances reaches 56 %. The oil debit of the lower-Jurassic horizon is 17,8 m<sup>3</sup>/day on 5 mm shuttler. The oil is heavy, the density is 889 kg/m<sup>3</sup>, the contents of sulphur and asphaltogenics decrease to 37 %. Oils of the discovered deposits contain fractures, which boil up to 300 % - 22%. The gas content of the oil found in the layers is 8-2 m<sup>3</sup>/tons. The foot waters are represented by weak brine with solidity of 115-1170 kg/m<sup>3</sup>, mineralization from 38 g/l (horizon II), of the chloride-calcium type with debits from 38 to 92 m<sup>3</sup>/day.

The Baklaniy oil-field is situated in the southern near-board zone of the Near-Caspian depression. It is located in Atyrau oblast, 60 km north of the town of Atyrau.

It was prepared by seismologic prospecting and structural probing in 1956. Exploration drilling was initiated in 1959, and the deposits were discovered in 1961. In the tectonic respect, the deposits adjoin the three-winged saline-domed structure. Two oil horizons have been distinguished in the chalk layer: upper-albic and aptic. The depth of the horizons in the vault is 294-513 meters. The height of the deposits is 42-18,9 meters. The water and oil contact is at the absolute points of 328,8-535,6 meters. The deposits are stratus and tectonically screened. The horizons are formed by the terrigenous sediments; the collectors are porous. The oil-containing layer is 2-4,1 m, the open porosity of the collectors is 29-32 %, the permeability is 0,208-1,78 mkm<sup>2</sup> and the oil content coefficients are from 0,53 to 0,8. The initial oil debits are 24-35 m<sup>3</sup> per day; the initial stratus pressure is 2,84-4,37 MPa; the temperature is 19,5-20 degrees Celsius. The oil density is 899-911 kg/m<sup>3</sup>. The oil contains 0,42-1,3 % sulphur and 0,29-0,54 % paraffin. The deposits in this location have been under development since 1994. 38 tons of oil were extracted until 1998 (18 thousand tons in 1996).

Some separate, insignificant deposits of raw materials for brick production of low quality are possible in the sea and river valleys of the region, for example in Makhambet.

Along the river Ural, some poor deposits of construction sand may also be found. It should be noted that clay sands, supeses and loams prevail in the mouth part of the river, in some places with admixture of broken cockle-shells. Sands of this kind are situated near Baksai, Saraichik and Sorochinskoye settlements.

### 2.1.5. State of the soil surface

According to the scheme of the natural and agricultural division of the area and utilization of the land area, Kazakhstan is situated in the desert zone of Aral-Caspian province. The peculiar feature of the soil surface is a distinctly expressed complexity of inter-zonal soils (riverbed meadow and meadow saline soils, slightly salty and saline lands) (Figure 2.1.3).

According to the soil evaluation materials gathered by the Complex-Research department in 1990, the meadow usual clay soils have received the highest mark of 18,9 for non-meliorated agriculture, the meadow usual medium loamy meliorated -52,2, and the lowest mark of 0,8 was given to the salty brown-grayish small-grained heavily loamed soils.

According to the data on the lands, collected by the Complex-Research department of the “Kazgiprozem” Institute, the systematic list of soils is presented in Table 2.1.11.

The saline soils are widely spread in the region and are represented both in the form of solid massifs and in the combination with other soils. They occupy 44 % of the total agricultural area.

The meadow soils occupy over 29 %, and along with the riverbed-meadow soils, play an important role in the economy of the region, being used as hay grounds and plough lands.

The brown-grayish lands occupy 14 % of the territory and are used as pastures.

The marsh soils are not as widely spread as all the others (only 1,9 %); they occupy the bottom of lowlands of the relief, which have limited or no outflows.

All the soils of the territory under study have a small humus content, a comparatively small capacity of the humus horizon and a low content of elements of ash consumption (Table 2.1.12).

The analysis of the melioration state of the irrigated lands shows a large percentage of saline lands and the presence of salty complexes. Saline irrigated plough lands occupy 2,7 thousand hectares, including 1,9 thousand hectares of the medium salinity. The presence of saline complexes is noted over an area of 3,4 thousand hectares, including 0,7 thousand hectares with a salt content of over 50%.

Saline soils are in need of preliminary washing out with the following irrigation of the washing type with the drain background; salty lands require the use of anti-salinity technical devices.

The territory of Makhambet region has a small number of industrial enterprises, besides the exploration of Baklany and Daramol deposits. The pollution caused by enterprises is presented in gas, liquid and solid forms, including garbage. Gas-like and liquid emissions get into the atmosphere and then into the soil; they negatively influence the soil, increasing its acidity and worsening its chemical and physical characteristics. The water with admixtures of oil and oil products becomes absolutely unsuitable either for economic use or for domestic water supply.

Table 2.1.11

**The total area and content of the agricultural lands in Makhambet region,  
thousand hectares**

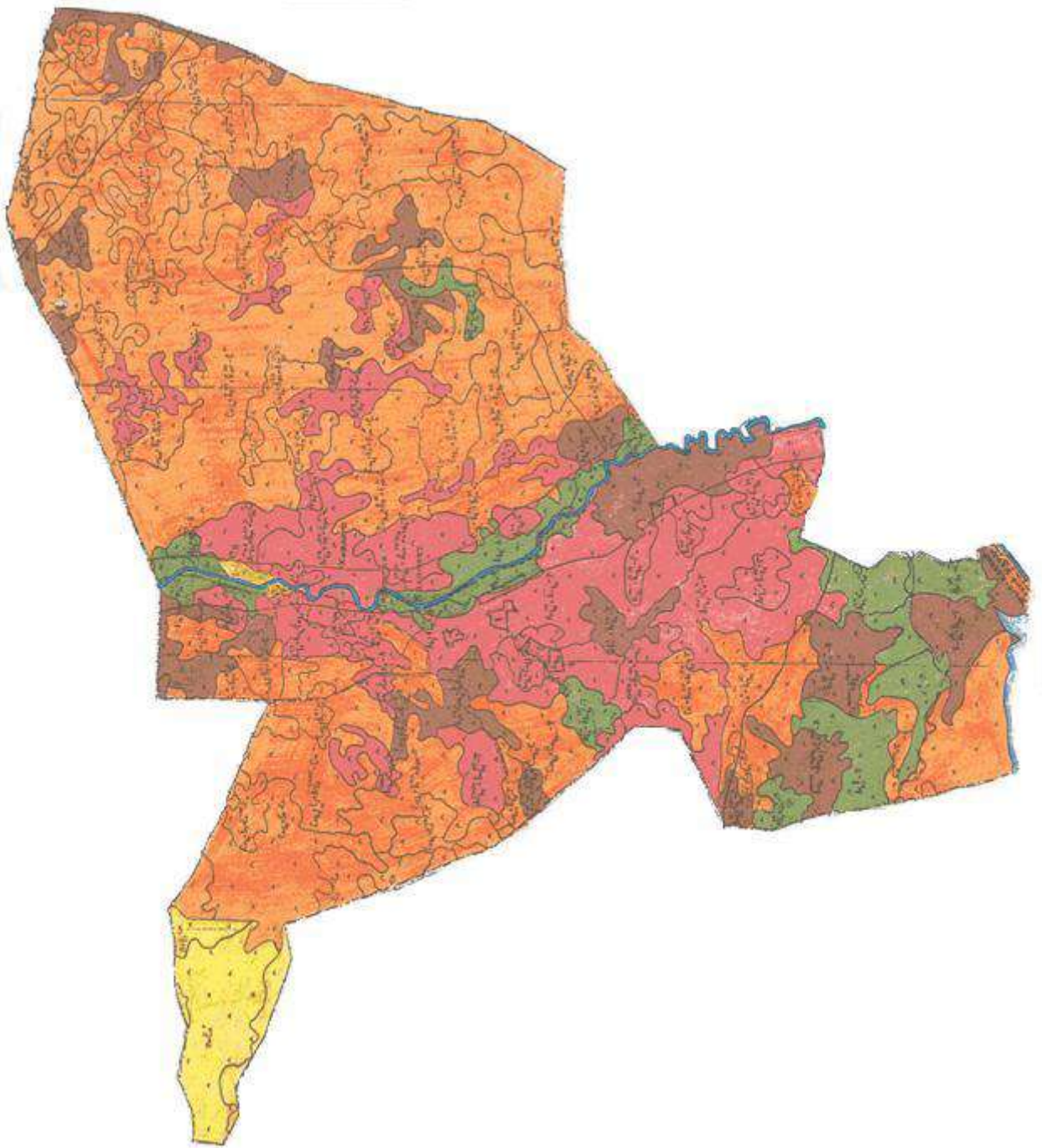
Name of soil and agricultural land	Total area	Including								
		Plough lands		Deposit		Perennial plantations	Hay grounds		Pastures	
		th. hec.	% %	Th. Hec.	% %		Th. Hec.	% %	Th. Hec.	% %
1. Brown-grayish salty	98,8	-	-	-	-	-	-	-	98,8	15,7
2. Meadow saline	154,9	2,7	32,1	2,5	54,3	0,3	11,5	40,1	137,9	21,9
3. Riverbed-meadow	23,5	4,2	50,0	1,5	32,6	-	1,5	5,2	16,3	2,6
4. Riverbed-meadow saline	18,4	1,2	14,3	0,6	13,1	-	3,6	12,5	13,0	2,1
5. Meadow-marsh	12,5	-	-	-	-	-	1,6	5,6	10,9	1,7
6. Outcomes of salty clays	32,2	0,1	1,2	-	-	-	10,5	36,6	21,6	3,4
7. Saline lands	30,3	0,2	2,4	-	-	-	-	-	30,1	4,8
8. Slightly salty lands	300,0	-	-	-	-	-	-	-	300,0	47,8
Total:	670,6	8,4	100,0	4,6	100,0	0,3	28,7	100,0	628,0	100,0

Table 2.1.12






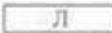


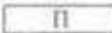








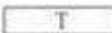

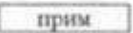















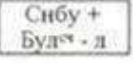

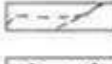









**Morphological and chemical characteristics of soils in Makhambet region**

Name of soil	Capacity of the humus horizon, m	Depth of the deposits of water dissolving salts, cm	pH	The absorption Volume mg/kv for 100 g of soil	Total content, %	
					humus	nitrogen
Brown-grayish salty	30-32	60-65	8,1-8,8	12-7	1,2-0,6	0,07
Meadow saline	30-60	from the	-	18-10	to 2,0	-
Riverbed-meadow	50-80	surface	8,7	12-11	2,7-2,3	-
Riverbed-meadow saline	20-30	from the	7,4-8,7	10,8-8,7	4,0-2,3	-
Saline lands	0-10	ur.	8,3-8,6	-	0,5	0,3-0,01
Slightly salty lands	10-40	from the surface	8,3-9,4	13-5	1,2-0,3	0,08-0,02

The quality characteristics of the irrigated lands are presented in Table 2.1.13.



**Figure 2.1.3 Soil map of Makhambet region  
Scale 1:700000**

	flood meadow brown				clay
	flood meadow-swamp brown				weakly loam
	swamp brown				sand
	meadow-swamp brown				medium loam
	meadow-swamp brown coastal				sand loam
	brown				heavy loam
	meadow-brown				
	meadow brown				10-30%
	meadow brown coastal				30-50%
	sands				
	salt meadow				
	sandy sand				
	sand coastal		centers of regions		dry river beds, arms
	Soil index according to systematic list of RK and mechanical constitution of soils		other settlements		canal and ditch system with the direction of water stream
	complexes, combinations, spotting		highway, railway		pastures
	soil boundaries		rivers, creek with the direction of water movement		irrigated land
			irrigated land		hay-meadow
					

**The quality characteristics of the irrigated lands in Makhambet region,  
thousand hectares**

	Plough lands	Perennial plantations	Deposit	Hay lands
1.The mechanical content:				
-heavily loamy	2,3	-	0,4	0,3
- medium loamy	2,7	0,1	0,6	0,3
- light loamy	1,6	0,1	0,6	0,1
- sub-sandy	1,4	-	0,4	0,2
- sandy	-	-	-	0,1
2. According to the degree of salinity:				
- total secondary saline	2,7	0,1	0,7	-
Including:				
- slightly saline	0,8	0,1	0,3	-
- medium saline	1,9	-	0,4	-
- heavily saline	-	-	-	-
- saline lands	-	-	-	-
3. Salty complexes:				
- total	3,4	0,1	1,0	0,3
Including with the content of salty lands:				
- slightly (10-20%)	2,7	0,1	0,5	0,1
- medium (20-50%)	-	-	0,4	0,1
- heavily, over 50 %	0,7	-	0,1	0,1

Along with the industrial pollution, the low cultural organization of the agricultural production, which is not oriented on preservation and improvement of the nature, has a negative effect on the soil.

For agricultural production the following factors are characteristic:

- chemical and bacterial contamination of the soil, water and atmosphere;
- pollution of soil, water and atmosphere, due to the incorrect technology of utilization, and non-observance of norms of spreading mineral fertilizers and herbicides;

- biological misbalance, due to creation of vast crop areas of monocultures, incorrect irrigation, drainage, hay mowing activities, and outbreaks of certain types of diseases and the spread of pests. A small amount of farming lands of comparatively low arable quality are located near the main water arteries of the region; this causes a comparatively low level of appliance of chemicals and mineral fertilizers. Non-observance of the norms, doses and dates of spreading and use of chemicals and fertilizers can lead to contamination of soil, water and, finally, the agricultural products. This lead to the prohibition of use of chemicals of GXTsG type and some others in the region. The data have been confirmed by examination of some agricultural products, conducted by sanitary epidemiological

services; in particular, an excessive content of MPC on GXTsG in 10 units was found in cabbage at “Pervomaisky” JSC.

Proposed activities for the prevention of contamination of the soil and agricultural products include:

- strict observance of the norms, doses and dates of appliance of mineral fertilizers and chemicals;
- strict annual examination of the fields for the residual content of nitrogen, phosphorous and potassium, as well as the products of disintegration of the chemicals;
- obligatory annual rotation of fields where spread of mineral fertilizers and chemicals occur.

Taking into consideration the different types of automobile transport in the region, it is necessary to point out the following:

- the automobile transport is concentrated in central farmsteads and settlements, which have the largest density of population;
- the territorial influence as a pollutant of agricultural grounds, with regards of intensity of the traffic, is minimal - not more than 0,41 MPC in a 50 m zone from the motor-way (Table 2.1.14);
- comparatively insignificant intersection of the relief; a lack of near-lying watertight horizon (clays and other materials) allows lead and other toxic elements to accumulate in the soil and plants in the area adjacent to the roads.

Table 2.1.14

**Rated indicators of MPC, concentration of lead in the soil along the motorways with MPC 10 mg/kg = 1,0**

Name of road	Intensity of traffic per day		Indicators MPC of lead concentration, Distance from road				
	1985	2005	50 m	100 m	300 m	500 m	100 m
Atyrau-Makhambet	3056	33491	0,3	0,31	0,23	0,23	0,22
MakhambetKulagino	2691	4026	0,41	0,36	0,26	0,26	0,25
Zauralsky-Zhambul	1532	2292	0,23	0,21	0,15	0,15	0,14
Makhambet-Novobogatinskoye	462	642	0,06	0,06	0,04	0,04	0,04
Atyrau-Zauralny	1311	1962	0,2	0,18	0,13	0,13	0,12
Baksaisky-Novobogatiskoye	489	732	0,7	0,07	0,05	0,05	0,04

The table shows that the state of the near-road areas, regarding the pollution background, is relatively normal, as the indirect influence of lead has been calculated being 0,45 MPC. Nevertheless, 50 meters of the near-road area should not be used for any agricultural needs, and the fodder grasses from this area should be used in combination with 50 % of “clean” grasses from other grounds; direct livestock grazing is prohibited.

## 2.1.6. Flora and fauna

### 2.1.6.1. State of the flora

Formation of the vegetative surface of Makhambet region was influenced by the landscape conditions, its location near the rivers and the Caspian Sea, depth of mineralization of subsoil waters, degree of salinity and types of soils. In lowland areas, the influence of spring thawing waters is clearly observed and this causes more luxuriant vegetation than in other areas.

The aridity of the climate defines development of the vegetative surface, which is mainly represented by semi-bushes of kserophit and galophit vegetative communities with some presence of grass vegetation.

Flora of the region was formed not long ago from the historical swits of desert-steppe, meadow-tugai and galophit character.

The riverbed vegetation is luxuriant and diverse. Couch-grass-multigrass, solod, reed, couch-grass-sedge meadows are spread along the rivers. As a result of intensive use, the vegetative communities with dominating gorchak, bare solodka, dodartsia, brunet grasses are widely spread in the river valleys.

The coastal-saline type of vegetation is spread in the Near-Caspian part of the territory. A certain regularity can be noted in the dissemination of vegetation in the coastal areas: vegetative associations replace each other from the seashore to the peripheral areas and they are sensitive to any changes in the conditions of their location.

Reed associations/communities prevail almost everywhere on meadow-marsh soils in the coastal area and rogoz, tubered reed, phitosenoses in the forms of separate spots in the reed zone are spread on water-distilled lots of lands.

The most diverse in types are marevy, complex, bean and cross-set plants.

There are 31 type forms of vital plants, out of which the main are trees, bushes, semi-bushes, 2-year and many-year/perennial grasses.

According to the ecological forms of flora kserophits, hygrophits and hydrophits have been developed. The diversity of the ecobioforms defines the desert character of the flora.

The saline vegetation is widely spread across the whole territory under study. It is connected with natural factors, as well as with anthropogenic influences. Salty spots of land are found in the valleys and lowlands on coastal meadow-marsh dried, coastal meadow primitive dried, coastal turf, turf-stratus slightly salty and saline soils of various mechanical contents. From the number of annual solyankas (salty plants) the most characteristic are 3-stamened petrosimonia, Tatar goose-foot, cone-like and high sveda, sandy rogach, natronny, plague and leaf-deciduous solyankas. Solyankas create mono-dominative communities, those of sveda and petrasimonia. In some places among solyankas, ephemeric plants, such as Eastern mortuk, klopovnik, deskurainia Sofia have been developed; they form saline-ephemeric, ephemeric-saline and deskurainic-saline communities. Occasional bushes, such as selitryanka Shober. multi-flowered grebenshik are found, along with solyankas.

The bush vegetation is found in the valleys and lowlands on meadow primitive dried, turf, turf-stratus primitive slightly salty and saline soils of various mechanical contents. The dominating role belongs to solyanka Shober, multi-flowered grebenshik and usual zhuzgun. Bushes form together with solyankas and wormwood solitryanic-saline with ephemeric plants and bush-wormwood with ephemerals communities. Solyankas found have include Tatar goose-foot, leaf solyanka, 3-stamened petrosimonia and solyanka Paulsen. In spring ephemerals develop, among them there are such as life-piercing klopovnik and desert burachok. In some places, sandy and 1-stamened wormwood are found in the bush communities.

Sarsazan and potashnic vegetation are spread in the near-lake lowlands, as well as in vast valley depressions. Sarsazan forms monodominant communities with a small proportion of one-year solyankas, such as 3-stamened petrosimonia, cone-like sveda and plague solyanka. In spring among the sarsazan hummocks, ephemerals, such as Eastern mortuk, life-piercing klopovnik, are spread; they form sarsazan-ephemeric communities.

Potash communities occupy the sarsazan-like locations. Their vegetation is characterized by a small floral content. Along with potash life communities, solyankas are also found here, such as 3-stamened petrosimonia, cone-like sveda; they form potash-saline communities. The wormwood vegetation is widely spread on coastal turf and turf-status primitive saline and sandy-saline soils. One-stamened wormwood forms mono-dominant communities, or solyankas take part in the grass formation (petrosimonia, Tatar goose-foot, sandy rogach) and bushes (solyanka Shober, multi-flowered grebenshik), which create one stamen wormwood-saline and one-stamen wormwood-bush communities.

On the whole, the variety of the natural conditional causes a diversity of the vegetative surface. Every part of the territory, such the coast, the delta of the river and the steppe zone, is characterized by its own vegetative communities. Natural development of the vegetation has two directions: the meadow type prevails in the near-delta parts and the desert type in the central part.

Analysis of the current state of the vegetative surface shows that its major part has degraded as a result of desertification caused by the human economic activity (Volchegursky and others, 1992). Depletion of the vegetative surface takes place. The number of vegetative types has decreased, some of them have disappeared completely, and the amount of weed plants has increased (Kurochkina, Shabanova, 1994, 1995). Every 25-30 years the change of predominant plants occurs on 25-30 % of the area. In the delta of the river Ural and for hundreds of km along the coastal line of the Caspian Sea there are reed thickets, very often mistakenly called bulrush (Drizo, 1961; Klimentova, Fedoseev, 1995). Reed is a perennial plant, which is related to the family of cereals; it is a hydrophilic grass with a pyramidal panicle. Out of 3 known types of reeds the most wide spread here is the common reed. It is a root plant, which usually grows in shallow parts of water bodies, such as lakes, rivers and others, and reaches 9 meters in height. Reed is also found in meadows, marshes, sands, saline lands but in smaller amounts, though it can stand salinity of the soil quite well. In dry places reed usually grows with shallow underlying subsoil waters. The usual reeds of 2 m high give about 10-

12 tons of dried mass from 1 hectare, and those of higher than 2 meters produce up to 40 tons from 1 hectare. Young reed contains much sugar and is widely eaten by horses and cattle, but before it forms a panicle it toughens and loses its feeding qualities. While mowing of 8-1- leaves in the phase of development, reed gives satisfactory hay, and harvesting before the phase of blooming produces good silage. Reed is used as a valuable building material (walls, roofs, fences) and for production of kamyshit, and is also used as fuel. Reed thickets in the delta of the river Ural occupy 85 thousand hectares (Ruslanov, 1995).

Reed thickets play a significant role in reducing bank abrasion, as they hinder waves, and in transformation of the chemical content of the river flow into the sea, in the development of productive-destructive processes, sedimentation of weighed particles, sorption and sedimentation of organic substances on the weighed particles and pollutants (Metrevely, 1995).

It is possible here to give a brief outline of different agricultural grounds and other lands.

The plough/farming lands are usually covered with weed and semi-weed vegetation, such as kokpek, adraspan, ehinopsylone and others. In the areas affected by sea flooding, azhrek is also found. Irrigation canals and other irrigation structures occupy about 10-20 % of its area. Irrigation and main canals have a diverse content, luxuriant vegetation of some rare types, which usually mark the anthropogenic loads: astrogal, solodka, veinik in combination with the background cereals and weed grasses, such as reed, couch-grass, azhrek, mari, goose-foot, solyankas and rare bushes of tamarisk, willow and loch. In this respect, the irrigation canals have created preserves for conservation of rare species and biosenosis.

The irrigated plough lands are located along the river Ural. Installation of closed drainage with filtration filling in and switching to the DDA-100, irrigation would make it possible to avoid the secondary salting of soils and increase by several times the utilization coefficient of the irrigated farming lands, as has been practised in many states of the USA for a long time.

Hay grounds: these parts of the lagoon irrigation and natural hay lands are, mainly, situated in the sveda-kokpek zone with high grasses, a high annual increment of biological mass and a rich species content. Extensive use of the natural hay lands in the sveda-kokpek zone is hindered by its location far away from human settlements as they occupy, mainly, the areas of annual flooding, and the areas near the sea on temporary mandated soils, which is impenetrable for transport. Due to the high increment of biological mass on natural hay lands, their degradation is low, despite rather high anthropogenic loads.

Pastures occupy more than 80 % of the area. Main degraded lots of land are situated on both sides of the river Ural, and spread for 10-15 km and more, near human habitation, peripheries of sand massifs and along the irrigation canals and waterways.

Degradation of pastures is noted here, due to overgrazing near the watering-places, namely, along the river Ural, Kudylys, Algabas canals and others. Intensive sand scattering by winds at the boundary with the valley of the river Ural, formed by clays and loams, is not only caused by transport loads. High speed winds on the

flat valley are sharply hindered on the uneven sands. As in the wooded area, the main wind zones are situated in the peripheral parts of large uninhabited marshes. Besides, in the peripheral parts of the sand massifs the increase of the number of settlements and wintering places has been defined by near the surface location of fresh and slightly salty waters. The transport loads prevail along the communication ways and near the settlements, both transport and grazing ones. The main growth indicator of grazing lands, in the order of their increase is the following ecological line: ephemerals-background phytocenoses-torgiot-ebelek-itsigek, adsaspan. Phytocenoses with high participation of ephemerals are characterized by the presence of excessive abatement along the surface of the soil. Background phytocenoses are characterized by complexity, with a small presence of weed grasses and stable increment of biological mass. Substitution of biyugun by torgiot at the initial stage of degradation of pastures results in some improvement of economic characteristics. In this case, they can not be considered degraded but rather torgiot, having replaced biyugun, is characterized by optimal grazing. Ebelek characterizes a sharp decrease of the biological mass. The final stage of degradation is almost overall/continuous itsigek or agraspan. The capacity of pastures becomes insignificant; the location of the degraded pastures is closely connected with their water-supply.

Less degraded are areas less supplied by water places. Cattle are able to use azhrek, which is 20 cm deep. In the water-distilled parts of the Caspian region, superseding of edible grasses by poisonous grasses and weeds along the river Ural has acquired a catastrophic character. But a lack of supervision in order to prevent overgrazing of the lands may have grave consequences. It is necessary to graze livestock not in places convenient for people but with unused annual increment of the biological mass. Grazing should be sensibly limited.

**Woods** occupy the riverbed of the Ural, which undergoes an annual flooding. They consist of willow, tamarisk and loch. The rest of the wood cultures are represented insignificantly. Although the woods are in an almost critical state, sanitary log-cutting work has increased, and wood restoration takes place along the sandbanks, the grass surface of the woods is in a comparatively good state. This is due to fencing, and relatively well-organized protection of the woods from grazing. A diverse species content of the grass flora consisting of astrogal, veinik, solodka, podmarennik, mint and many other species, including desert-steppe ones, has been preserved on the lands of the state forest. Movement of the Ural riverbed can be considered as a positive event for wood preservation, as the woods are restored nowadays only on the new sandbanks covered by seasonal flooding.

**Land unsuitable for agricultural use.** This includes dead sors and the zone of seasonal-weather pseudolittoral; their formation is determined by natural factors and, insignificantly, by anthropogenic ones. Very heavy and exclusively heavy salinity does not create the ecological conditions for any vegetation.

Makhambet region is situated in the desert zone of Aral-Caspian province in Naryn even sandy (western part) and near-sea even-lowland (eastern part) districts.

For the vegetative surface the prevalence of kserophil semi-bushes, which create homogeneous, rarefied cover, is characteristic.

One of the most common pastures in the valley are wormwood. The pastures of this group are formed on brown-grayish soils. The group is represented by white land wormwood-ebelek, wormwood-itsigek, wormwood-salty types. White land and Lerhovsky wormwoods predominate. Subdominants are opposite-life klimakoptera, galimoknemis, cone-like sveda (Figure 2.1.4).

Ephemerical pastures are spread in the valleys. They are represented by ephemerical and ephemerical-saline types. In the vegetative surface ephemericals, such as Eastern mortuk and bulb myatlik dominate. Solyankas are represented by opposite-lief and wool-like klimakopters, cone-like svedas and bushy galimoknemis. Ephemerical pastures should be used in spring and ephemerical-saline in spring and autumn for grazing all kinds of livestock. The most spread pastures in Makhambet region are biyungun. They are formed in the valleys and salty lands. The group of biyungun pastures is represented by biyungun, biyungun-saline and biyungun-ephemerical types. Biyungun pastures are usually found in the form of big massifs.

The most common pastures on the salty lands are the group of black wormwoods, which are represented by the black wormwood-saline type. Among solyankas the most common are biyungun and torgiot.

Sarsazan pastures are spread in the near-sor depressions on saline lands. Individual occurrence of cone-like sveda and biyugun has been noted.

Sarsazan, biyugun and black wormwood pastures should be used in autumn for camel, sheep and horse grazing.

Wormwood pastures are found in the lowlands of the valley and along the Ural riverbed on meadow-marsh, riverbed-meadow soils. White land and Lerhovsky wormwood predominate. The pastures are very intensively used, which leads to the spread of weed vegetation such as ebelek, mortuk, dodartsia, zhantak and gorchak. The wormwood pastures are recommended for use in the spring-summer period for grazing all kinds of livestock.





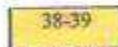






Solyanka annual pastures have gained a considerable spread. This group contains the types of pastures with the prevalence of annual solyankas, such as petrosimonia sizovataya, fat (myasistaya) and wooly klimakopteras and cone-like sveda. One-year solyanka pastures are formed in land depressions, the Ural riverbed and costal areas on meadow, riverbed brown-grayish soils. They are mainly represented by the petrosimomial and solyanka-ephemerical types.

They are found in combination with the sarsazantype of pastures. One-year solyanka pastures should be used in the autumn period for sheep and horse grazing, and saolyanka-ephemerical in spring-autumn for grazing all kinds of livestock.















Goose-foot pastures are spread along the river Ural on meadow-brown-grayish soils. They are represented by the goose-foot-solyanka type. They should be used in the spring-summer-autumn period for grazing all kinds of livestock.



## Ecosystem groups

- 
psammophytic shrub vegetation (8) mostly жугунокъй (8), on the automorphous sandy soils of non washed type.
- 
Halophytic suffrutescent (солъкоколосковъй) and suffrutescent (14, 15, 18, 19) mostly сарсаг (15) on the hydrogenic and the half bog soils of washed type. Seaside salt soil, alkali soil, saline brown.
- 
halophytic and eohalophytic suffrutescent (20-30) mostly бноргункъй (22) and white land sagebrush (26) on the automorphous soils of the regularly washed and non-washed types. Salt soil, sodic soil, brown sodic and salty soils ( including sandy loam and sandy silt soils)
- 
hemi psammophytic suffrutescent (31-37) mostly white sagebrush лерхоломъй 32 and шакърокъ (36) on the sandy and sandy loam soils of the non-washed and regularly washed types (light nut-brown and brown)
- 
psammophytic and hemipsammophytic perennial grasses, large grasses and crops mostly ерек (38), and къа (39), gross forbs (45-48), ephemeroидс (43) on the automorphous soils of the regularly washed and non-washed types. Sometimes on the clay sandy soils with shallow groundwaters.
- 
xerophitic crops (60, 61) on the automorphous and полъагоморфъй soils of seldom washed types, light nut-brown and meadow light nut-brown.
- 
hydrophitic permanent crops mostly reed vegetations (62) on the meadow and meadow marsh land of the half bog and hydrogenic soils usually sandy and silty.
- 
halophytic annual grasses (80, 81) on the hydrogenic and automorphous soils (alkali and salt soils regularly washed and non-washed types.
- 
Гемипсаммофитъе annual grasses, mostly эфемероидъе (87) and эбелкоъе (90), weed grasses on the salty and saline soils, with sandy-loam soils on the surface, regularly washed and non-washed types.
- 
psammophytic and hemipsammophytic annual grasses and сухосолъкоъе (91, 98) mostly on
- 
the sandy and sandy-loam soils of the non-washed types.

the color matches with ecosystem's class. Numbers in the contour lines means the prevailing groups. Symbols show the ecosystems

- |  |  |   |
|--|--|---|
|  center of a region - Inderborgskiy |  other settlements - Budene |  oblast' boundary                        |
|  region boundary                    |  contour boundary           |  railway                                 |
|  main railless lines                |                             |  lakes rivers, intermittent rivers, arms |
| additional symbols   |  |   |
|  sor and salt soils                 |  sands                      |  plowing land                            |
|  hay-meadow                         |  bushes                     |   |

Azhrek pastures occupy lowlands, coastal areas on meadow-brown-grayish coastal saline loamy soils and salty lands on meadow-brown grayish soils. The group is represented by azhrek-beskilnit, azhrek-goose-foot, azhrek-buckweat types. They are found as individual formations or in combination with the solyankas and goose-foot types. In azhrek pastures grazing all kinds of livestock is possible in the spring-summer-autumn period.

Hay mowing grounds are formed in lowlands, river valleys on meadow-marsh soils; they are represented by the reed, couch-grass, couch-grass-wormwood, azhrek, bulrush and beskilnitsky types. The area of hay mowing grounds is 16,6 thousand hectares, the productivity is 4,6 metric centner/hectare of feeding units.

Flora of Makhambet region is represented by a number of wild useful plants:

- medicinal: black belena, sandy besmertnik, hawthorn common garmala, bitter wormwood, Ural solodka, field hvosh;

- tanning: willow, Tatar reven.

- technical: leafless anabasis, common reed.

- fibrous: kendyr, weed hemp, glittering chiy.

In the Red Book are included the following plants: lutserna Komarova, chalk marena, nagolovatka Fedchenko, wide-lief solyanka and shpazhnik chereschaty.

#### **2.1.6.2. State of the fauna**

In many aspects the fauna of Mahambet district is similar to those of Zhylyoisk district and belongs to the area of Northern Aral-Caspian deserts. The local composition of fauna species is poor. Taiga, European-manchzurs and mountain-forest species are completely absent here. Among European species only muskrat can be noted occasionally met on the former river-bed of the Ural. Forest species are poorly represented which are normally common. Among bushes on sands and forests, the weasel lives in ravines. In meadows of small rivers banks in the northern part of the district common field-vole settles. River and lakes provide habitat for the water rat. The rare sand shrew, six southern mesophilic species such as the small shrew, brown bat, brown hare, grey hamster, wild boar and jungle cat are the elements of Turanian fauna in the interfluvium of the Volga and Ural rivers. The wild boar and raccoon dog acclimatized here lives on the northern coast of the Caspian Sea while the Caspian seals enter the mouth of both the Volga and Ural rivers.

In the Northern Pre-Caspian Sea, there is a population of saigas who make regular migrations from the south to the north in spring - summer and from the north to the south in autumn-winter. It is known also, that a part of the Usturt population of these antelope crossing the Ural river move in summer on its right bank where they partially mix up with saigas of the forest habitat.

Fauna of amphibious and reptiles is relatively poor which is caused by environmental conditions. The high salinity of soils, large net of solonchaks with

impoverished vegetation, extremely continental climate, flat terrain, all aggravate the harshness of the climate, especially during wintering in low-snow winters.

Amphibians on the Caspian Sea coast and adjacent territories are represented by two species such as green toad and lake frog. The toad's ability to withstand significant aridity of air, nocturnal lifestyle and use of intermittent saline water reservoirs for spawning provide for their living in the territories remote from the water bodies.

Reptiles in Mahambet district area include 20 species. The basis of reptiles' fauna is 11 species of the desert familia such as Central Asian turtle, squeaky, Caspian and grey geckos, sunwatcher, eared toad agama and toad-agama, steppe agama, racerunner, sand boa and steppe ribbon. Other species as common water snake, four-lane snake and Pallas' coluber, Central Asian pit viper are of wide intrazonic distribution.

The Middle Asian desert complex is of the greatest densities amongst reptile fauna while european-Siberian and Central Asian that occurred from the north and the east are less represented.

Stepperunner is the more numerous in natural clay, solonchak and partially sandy deserts of region whereas racerunner, eared toad-agama and toad agama are frequent in sandy areas.

At the sites less affected by anthropogenic pressure, i.e. located beyond oilfields, amongst the most common reptiles lizards are the most numerous including steppe agam, sunwatcher and stepperunner. Their density reaches 3-4 individuals per 1 km or 1.6-2 individuals/ha. At the same sites, snake species are represented by Palla's coluber, steppe ribbon, and Central Asian pit viper, though the number of these species is lower than lizards being 0.4-0.5 individuals/ha (up to 1.5 individuals per a km). Squeaky geckos and grey geckos have the same level of density.

Coastal cenosis is the most densely populated where common water snake and Pallas' coluber are numerous represented by 5-6 individuals per a km. The distribution of other reptiles is constrained by periodic flooding of territory, which supersede many species.

A special place in the reptile distribution is given to transformed landscapes such as dykes, road embankments, power lines, oil pipelines, inhabited and industrial structures which sometimes enrich lifeless spaces (especially solonchak deserts) by creating new ecological niches, habitats for certain lizards and snakes. The population density of reptiles in these habitats is normally higher than in natural. However, here animals are subject to risk of hydrocarbon pollution from oil pipelines during spills and from motorways.

Mammals in Mahambet district and adjacent territories is represented by 56 species (31.5% from the total composition of terrestrial fauna of Kazakhstan) which include 5 rare and threatened species listed in the Red Book of Kazakhstan such as Bobrinsky bat, marbled polecat, Persian gazelle, Ustrurt mufflon and Asiatic wild ass (Mammals of Kazakhstan, 1969-1983; Book of Genetic Fund of Kazakh SSR fauna, 1989; the Red Book of Kazakhstan, 1996). The group of rodents (15 species) is the

most common including 8 species carrier of dangerous infections for human being and domestic animals.

Predators are relatively diverse comprising 9 species and most of them are objects of hunting. These are wolves, korsaks, foxes, weasel, steppe polecats and Caspian seals. Among this group, the wolf, fox, steppe polecat have the most significant populations while the Caspian Seal is the most common in coastal and aquatic cenosis.

Over the last decades, the monitoring over the state of rodents-carriers of dangerous infections such as Siberian jerboa, Feather-tailed three-toed jerboa, Hairy-footed jerboa, Grey hamster, Gerbils that are widely distributed in desert landscapes has been carried out by Anti-pestilence Service of the Republic of Kazakhstan which covers also the Pre-Caspian area. The account of their number is based on standard techniques with application of traps on the area of 1 ha and calculation of holes. The rodents that lead the nocturnal way of life are counted from cars while casting the light of headlights on routes. The results collected by different methods are recalculated for the area of 1 ha, 100 traps/day, or 10 km of a route.

The number and density of a large gerbil in natural desert landscapes is relatively low varying between 0.6 up to 6 individual/ha. The density of midday gerbil and Libian jird is even lower (0.2 – 4.8 animals per 100 traps/day). Among jerboas, small jerboa is the most frequent constituting 90 % of the total jeboa population (5 individuals per 10 km of a route).

Even in natural landscapes, the density of background species such as the common vole and synanthropic species such as the house mouse changes from 0.6 to 6 individuals for 100 traps /day. At the same time, during periodic flooding of the Caspian coast, small mammals are practically superseded, and in the industrial zone due to desertification and pollution of habitats, these animals are seen rarely, less than 1 individual per ha.

Around 200 birds species are sheltered in terrestrial habitats. The number of birds in desert habitats of the Caspian coast is insignificant being no more than 50 birds per km. At the desert sites adjacent to oilfields, the number of nesting birds is 2 times lower while at sites severely affected by anthropogenic pressure (oil fields, access roads, drilling rigs etc) with completely degraded soil - vegetative cover, it is extremely rare to see any bird.

The game fauna of Mahambet district is composed of representatives of steppe, semi-desert and desert biocenosis. They include the following species:

Mammals: saiga, wild boar, wolf, korsak, red fox, steppe polecat, Russian hare, muskrat, and souslik;

Birds: goose, duck, teal, snipe, coot, grey partridge, and pigeon;

Fish: catfish, pike, pikeperch, sazan, carp, bream, ide, tench, perch, crucian carp, roach and other.

In 1990, the Institute of Zoology of the Academy of Science of Kazakh SSR completed the counting of saiga and birds. Overall, 20 animal species and 70 birds

species both of the game interest live on territory of Mahambet district of which 6 animals and 25 birds are listed in the Red Book.

### **2.1.7. Management, treatment and disposal of industrial and domestic waste**

There are no large oil and gas exploration and development enterprises in Mahambet district except for two oil fields Northern Baklaniy and Daraimola. Animal husbandry and melon growing are the prevailing sectors of the local economy. Nevertheless, the railway lines connecting Atyrau - Astrakhan, Makat - Aleksandrov Gaj, and the gas pipeline Central Asia-Centre (58 ha), oil pipeline Uzen - Samara (44 ha) and of the Caspian Pipeline Consortium (CPC) pass through the territory of the district. Moreover, a condensate pipeline Big Chagan – Atyrau is being built and along the routes of these pipelines Katmanov and Atyrau Oil Pump Stations, KS “Redoubt” and a number of the small industrial enterprises are located.

As a result of the activity of industrial, building, power, transport, utility enterprises and organisations concentrated in densely populated centres such as Makhambet, Chkalov, Almaly and Akzhaik, various types of liquid, solid and semi-solid and gaseous waste is generated. The waste management is not systemised. Disposal grounds for special type of waste do not exist.

As of the state in 2000, the Mahambet district accommodates 22 stationary sources of harmful emissions. These sources of various enterprises emit 309.62 tons of harmful pollutants composed of nitrogen oxide, carbon oxide, sulphur anhydrite, unsaturated hydrocarbons, solid substances (dust) and others.

During construction (2001-2002) of condensate pipeline Big Chagan – Atyrau, the construction field camp will generate both household and industrial waste. All waste products of consumption formed at the territory of the field camp are attributed to solid household waste. During the civil works, the volume of solid household waste will make 150,411 tons in 2001 and 89,753 tons for 2002.

Solid industrial wastes include waste from vehicles, repair shop, packing materials, containers, used lubricants. All combustible solid waste products (packing material, household waste and containers) should be burnt in incinerators.

In Mahambet district, there are 3 warehouses for storage of mineral fertilisers with the capacity for 1,700 tons, including 2 standard warehouses for total 1500 tons.

In the next years, it is necessary to build warehouses based on the demand in mineral fertilisers for storage of both mineral fertilisers and pesticides. It is recommended to place them not closer than 200-500 m from residential houses and industrial facilities.

Accumulation of liquid manure at cattle-breeding farms represents big risk of pollution of water with nitrates. For organic fertilisers collected during the housing season, it necessary to provide the removal and storage system at facilities. The overall output of manure will roughly make 200,530.6 thousand tons.

Specific feature of animal husbandry waste is the high degree of their pollution with microorganisms and helminth eggs. Traditional way of animal industries operation with the use of a straw support, obtained “solid” manure undergoes biothermal disinfection at special sites within farm premises.

To calculate the area of these site, the volumetric weight of a solid fraction with the humidity 65-70 % should be 0.7 t/m<sup>3</sup>, the width of clamps at the bottom is 3.5 m, the top - 1,5 m, and height - 2 m. The distance between is 0.7 m. Rotor dispersers are used for bringing manure composed in special order in piles of 3 – 3.5 tons.

Wide application of chemicals for crop protection is another environmental issue as their wrong use results in pollution and at times in poisoning of soils and reservoirs. In order to protect soils and agricultural production from pesticide pollution, which may lead to their accumulation in human organism, the use of chemicals in agriculture needs a rational approach.

It is noteworthy that Akmalinsk county of Mahambet district is a subject of heavily man-induced pressure as here some large heavy industries are based including ANU, Atyrau OPS, Big Chagan – Atyrau OPS, two concrete building plants AtyrauEngStroy and Commercial base of road construction enterprises.

### **2.1.8. Historical and cultural monuments**

The famous Arabian traveller Ibn Battuta in his work “Travels on Desht-Kypchak” wrote that in XIII century the caravan ways connecting the West with the East, the city of Sarajchik was located on coast of the Zhajyk river (Figure 2.1.5). Sarajchik (Saraj - Djuk) was based in the modern territory of Mahambet district. It was a large city and shopping center of Golden Horde where the shortest way from Europe to Central Asia and China ran through. As assumed by historians, in 1395 Sarajchik was seized and nearly destroyed by Tamerlan’s armies, thus having shared the fate of most of Golden Horse cities. However, in 1580, it was completely demolished by Russian Cossacks. As documented by akyn Shaniyaz Shalay uly, who lived in the mid of XIX century, seven khans are buried in Sarajchik, namely Sartak, Berke, Tokhtakhia, Zhanybek, Kasym and the nogai khans Izmail and Uraz. Finding from Sarajchik ruins include glazed Iranian ceramic and Khorezm utensils made of grey clay, Chinese porcelain, bone pipes, mattocks, knives, fishing tackles which gives evidence that town people were engaged in trade, craft, melon growing and horticulture.

Jewellery ornaments typical for the area, jugs from burnt clay with patterns, wax candles, ceramic dining utensils, water pipes, and household objects were found at this site.

The study of the rich heritage of cultural and historical monuments of Mahambet district has only begun, but already today its contribution to the formation of national traditions, a spiritual life, culture of Kazakh people is clearly defined.

There is a number of the monuments distinguished by typology of art expressiveness and uniqueness. Based on data of Atyrau Regional State Inspection for Protection of Monuments and Historical Heritages (Alimgereev U., 2000), Mahambet districts has 183 historical and cultural monuments (Table 2.1.15).

The monuments of history include one dedicated to revolutionaries Egorov and Tolstov, killed by White Guards erected in 1922, to Fedin D. the first chairman Redutskogo Council (1922), a tomb of Kantsev, the Hero of Soviet Union (1980), and a sign showing the transition of the Zhajik River from Isatay to Makhambet districts (1836).

Another historical monument is an obelisk to soldiers- fellow countrymen fallen at Great Patriotic War (1975) in Makhambet village, and to participants of the Civil War at Sarajchik village (1967).

Archaeological monuments include Sarajchik city site dated IX - XIV century located 1.5 km away from Sarajchik village, sites of neolith, Kurgan № 1 of the bronze and iron ages 150 km away to the left from the Atyrau – Uralsk motorway.

Other archaeological monuments are Altyn-Kulpytas Necropolis, Uskenbai Mausoleum, and Kenzhaly Necropolis.

The objective of the modern town-planning studies is to develop measures that provide for conversation of monuments of history, material and spiritual culture.

## **2.2. Ecological conditions of Inderskiy district**

### **2.2.1. Brief description**

Inderskiy district is located in the northern part of Atyrau oblast. In the north it borders with the Western Kazakhstan oblast, in the east - with Kzylkoginsk district, and in the south and southwest with Makhambet and Isatay districts. Its area is 1087.6 thousand ha.

The administrative centre is Inderborsky towm located 190 km from Atyrau city. Roads of the Republican importance Atyrau-Uralsk and Atyrau-Indebosky connect the district and oblast centres.

According to Oblast Statistics Agency, the population of the district is 28.3 thousand people, including 16.6 thousand people living in rural areas and 11.7 thousand people of urban areas. From the total rural population, 16.6 thousand people are engaged in agricultural production who live in in 16 settlements, of which are the central farms and 10 – farm branches.



**Figure 2.1.5 Monument of the Golden Horde khans' headquarter  
in Sarajchik settlement in the 13-15 centuries**

**List of available monuments, busts, memorials, and obelisks in Mahambet district as of 01.11.2000**

	Name of a monument	Location	Date of erection	Adminstring organization
1	2	3	4	5
1.	Tomb of Egorov and Tolstov (1922)	Sarajchik village	№ 289, 18.08.81	Municipality of Sarajchik village
2.	Tomb of Fedin D., the first chairman of Redout Council (1922)	Redout village	№ 233, 28.08.80	Redout administration
3.	Tomb of Kantsev G.F., the Hero of Soviet Union	Makhambet village		SSh of Shonaev
4.	a sign showing the transition of the Zhajik River from Isaty to Makhambet districts (1836)	Sargutai village	№ 312, 17.08.87	Municipality of Sargutai village
5.	Brass to to participants of civil war	Redout village	№ 457, 14.12.76	JSC «1st May»
	Archeological monuments			
1.	Sarajchik Site XI-XVI	1.5 km from Sarajchik village	№ 38, 28. 01.82	Municipality of Sarajchik village
2.	Site of neolith. An epoch of neolith	On the left bank of the Ural river	№ 312, 17.08.87	Kairshakhtinks aul

Table 2.1.15 continued

1	2	3	4	5
3.	Tombstone of XIII-XX centuries	Sarajchik village  150 km to the left from Atyrau – Uralsk motorway To the right from the motorway 112 km from Atyrau city  To the left from right from the motorway 122 km from Atyrau  To the left right from the motorway 130 km from Atyrau city Near Kulagino village Near Kulagino village To the right from the motorway 140 km from Atyrau city 144 km away from Atyrau city	№ 38, 26.01.82	Municipality of Sarajchik village
4.	Kurgan № 1 of bronze and iron age			
5.	Kurgan № 2			
6.	Kurgan № 3			
7.	Kurgan № 4			
8.	Kurgan № 5			
9.	Kurgan № 6			
10.	Settlement of the bronze age			
11.	Site of the beginning of the XI century B			
	Monuments of cult and civil architecture			
1.	Tegen Necropolis. Kulpytas. With a fence.			
2.	Zhangeldy. Saganatam and kuplytas. End of IX century			
3.	Zhnageldy Necropolis. Kulpytas № 21853			
4.	Anonymous necropolis № 4, sagantam of the end of XIX century of item.	10 m westward from 23 km road of Tanday village		
5.	Anonymous necropolis № 4, kulpytas			

Table 2.1.15 continued

1	2	3	4	5
6.	Anonymous necropolis № 27, kulpytas № 1, 1886	80 km to the east from 76 km Atyrau-Inder road		
7.	Anonymous necropolis, kulpytas № 1 1888.			
8.	Meirman Mausoleum, saganatam of XIX century.	35 km to the northwest from Sargutai village		
9.	Adim Necropolis, saganatam, 1913	35 km to the southwest from Zelenyi village		
10.	Kenzhaly Necropolis, saganatam, 1913	16 km		
11.	Kenzhaly, kulpytas, 1913			
12.	Shynybek Necropolis, the end of XIX	14 kms to the southwest from Zelenyi village		
13.	Shynybek, kulpytas № 1			
14.	Shynybek, kulpytas № 2, 1870			
15.	Shynybek, kulpytas № 3, 1805			
16.	Shynybek, kulpytas № 4, 1807			
17.	Necropolis № 90 XIX century	23 kms to the east from Atyrau		
18.	Necropolis № 91 XIX century	24 kms to the west from Atyrau		
19.	Necropolis № 91, saganatam №1			
20.	Necropolis № 91, saganatam №2			
21.	Necropolis № 92, kulpytas XIX century	In 3 km to the south from the 17 crossing point		
22.	Necropolis № 92, kulpytas XIX century			
23.	Necropolis № 93, kulpytas XIX century			
24.	Necropolis № 94, kulpytas XIX century			
25.	Necropolis № 92, Koitas 8 pieces			

Table 2.1.15 continued

1	2	3	4	5
26.	Necropolis № 95, Darkhbai	5 km to the southwest from the 17 crossing point		
27.	Necropolis № 96, Beshenkul Kulpytas			
28.	Necropolis, Darkhbai Kulpytas, 10 pieces, XIX century			
29.	Necropolis № 95, Baiymbet Kulpytas №98			
30.	Necropolis № 95, Kulpytas Saganatam, XIX century	2 km to the west from the wintering site Tuman		
31.	Necropolis, Kulpytas, 6 pieces, XIX century	2 km to the west from the wintering site Tuman		
32.	Ashei sheshe Necropolis, Kulpytas № 1, XIX century	3 km to the north -west from Baimbet necropolis and 15 km to the west from Akkistau		
33.	Ashei sheshe Necropolis, Kulpytas № 2, XIX century			
34.	Ashei sheshe Necropolis, Kulpytas № 3, XIX century			
35.	Necropolis № 102, XIX century	15 km to the west of Akkistau railway station		
36.	Necropolis Kulpytas № 102, 6 pieces			
37.	Saganatam 4 pieces, XIX century			
38.	Necropolis Kulpytas № 108, 4 pieces			
39.	Saganatam 6 pieces. The end of the XIX century	10 km to the north-west of the 17 crossing point		
40.	Necropolis Kulpytas № 111, 3 pieces XX century			
41.	Uskenbai mausoleum, Sagatanam of the XX century	35 km to northeast from the 15 aul		

Table 2.1.15 continued

1	2	3	4	5
42.	Uskenbai Necropolis, Saganatam of the XX century	35 km		
43.	Uskenbai Necropolis, Saganatam 5 pieces, XIX century			
44.	Zhasybai Necropolis, Saganatam 4 pieces			
45.	Necropolis Kulpytas 4 pieces, XIX century	10 km to the northeast from the 15 aul		
46.	Necropolis № 113, Saganatam 2 pieces	1 km to the north-west from the 15 aul		
47.	Altyn Necropolis, Kulpytas № 9 1960	1.5 km to the east from the road № 232 of 28.08.90 Atyrau-Inder in 4 km to northeast from the center of Zauralny sovkhos.		
48.	Altyn Necropolis, Kulpytas № 39 1960			
49.	Altyn Necropolis, Memorable sign № 31			
50.	Altyn Necropolis, Saganatam 3 pieces.			
51.	Sagatanam with Kulpytas, 2 pieces			
52.	Mausoleum 4 pieces, Kulpytas 48 pieces			

Table 2.1.15 continued

1	2	3	4	5
1. 2. 3. 4. 5. 6. 7. 8. 9. 10.	Obelisk to soldiers killed during Great Patriotic War of 1941-1945          Bust of V.I. Lenin 2 pieces.	Tandai Akzhaik Zhalgansai Chkalovo Alga Ortakshyl Almaly Makhambet Sarajchik Makhambet	1985 1980 1985 1979 1975 1975 1975 1975 1975	

Motorways are used for all means of transportations. The overall length of roads within the district makes 310.9 km. All central farms are located besides the roads of the Republican importance.

Due to the variety of mineral resources, the Inderskiy district is potential for development of the chemical industry, salt extraction and manufacture of building materials. Huge deposits of borates, potassium-magnesium salts, table salt, highly concentrated brine of multicomponent composition, carbonate raw material, gypsums, pebble-limestone and other building materials are concentrated in the region. Currently, in adjoining to Inderskiy territories many industrial enterprises operate including "Inderstroyindustriya plc", "InderSolt plc", "Zhayiktransgas" LPU and district printing-house. These enterprises are part of chemical and petrochemical, light, food and polygraphic industries.

The leading sector in terms of number of working places is the chemical and petrochemical industry; the second place belongs to the food-processing industry and agriculture.

Economic conditions for development of mineral deposits are favourable. In the immediate proximity to Indersk elevation the line of the main gas pipeline Central Asia-Center and oil pipeline Mangyshlak-Atyrau-Samara pass by. The railroad line Makat-Indeborskiy –Alexandrov Gai will be continued here. Moreover, the Atyrau-Indersk-Uralsk motorway of the Republican importance also passes nearby. The area has steady power supply through high-voltage power lines coming from Atyrau.

Based on its geomorphological characteristics, the territory of Inderskiy district belongs to the Pre-Caspian accumulative Upper Quaternary Marine, occasionally alluvial lowland of the marginal trough where the marine salinity is conserved and of partial Aeolian structure. According to the relief character, it represents the flat plain composed mainly of sand and partially clay loam Upper Khvalynian deposits and in the east of clay. The western part of the area is occupied by the largest sand array called Ryn-peski. In the north, Inderskiy elevation is prominent (up to 52 m of the absolute height) in the shape of many large salt domes formed because of protrusion of potassium salts deep deposits. Along the Ural, alluvial plains can be traced. The river floodplain has a plenty of flat and wide depressions which width changes from 1 to 6 km. In the east, there are many solonchaks, sors and takyrs. The absolute heights in the greater part of the territory change within 0-20 m below the sea level. The partitioning of the area by ravine-beam network is 0.03 km/km<sup>2</sup>, the depth of local erosion bases is 12 m, and the average gradient of water collectors is less than 1<sup>0</sup>.

The whole relief of the area provides for the development of sheep and chamois breeding. The Ural floodplain has many hayfields and irrigated lands.

The natural conditions of Inderskiy district predetermine a rather high capacity of atmospheric air for self-cleaning. According to the zoning plan based on the meteorological risk to pollution from ground sources, developed by KazNII GosComHydroMet, the territory of the district is located in the zone of moderate risk. The main pollution source is emissions of toxic gases from Inder OPS, "ZhajikTrasnGas"- Inder LPU.

Local sources of pollution include heat and power stations at human settlements, fuel stations, exhaust gases from motor transport.

In the hydro-geological attitude, the area is located within the Pre-Caspian system of artesian basins, which is an extensive and deep tectonic depression containing mainly brackish (1-3 g/l of salinity) ground waters of II hydro-geological region in which is subdivided in two subregions (IIb, IIg). The subregion IIb is located along the Ural River within the limits of Albian-Senomanian water bearing complex. The subregion IIg occupies the western part of area. The resources of surface water include transitional flows of the Ural River coming from the Western Kazakhstan. The Ural River flows through the area from the north to the south and divides the area in halves and does not receive any additional recharge. The local flow is formed in basins of intermittent water-currents and in broad gullies only in the spring.

The area of Inderskiy is attributed to the desert zone of the Aralo-Caspian province with basic background represented by brown soils. The feature of soil cover in the region is clear structure of intrazonal soils (floodplain-meadow, meadow saline, solonetz and solonchak soils). The soils of the desert zone have poor and thin humus horizon, low contents of ash elements, small absorption capacity, high carbonate concentration and salinity. Certain technogenic pressure and pollution of soils comes from main gas pipeline Central Asia-Center, oil pipeline Atyrau-Samara; motorways Atyrau-Uralsk, Atyrau-Inderboskiy, enterprises of the mining industry such as "InderStroyIndustry plc" and "Inder-Solt plc".

The vegetation of the area is typically almost void of Graminae and dominated by xerophyte and hallophyle shrubs represented basically by *Artemisia* and *Salsola* species. Amongst *Artemisia* *Artemisia terrae albae* is the most common in association with *Artemisia lerchiana* and *monogina*. In the north, *Artemisia* is mixed with *Stipa sareptana*, *Agropyron*, and *Euagropyrum*; in the south – with ephemers such as *Poa bulbosa* and *Bromus tectorum*. Weed and venomous plants are met in great numbers including *Euphorbia*, *Anabasis aphylla*, and also *Salsola* species including *Ceratocarpus arenarius* and *Ehinopsilon*. On solonetz soils, *Artemisia vulgaris* communities are met as patches while on sands, *Artemisia arenaria* is widely spread.

*Artemisia terrae albae* pastures are the most widespread in the area occurring on the plain, sands and the Ural river valley. They are more frequent in the plain on brown clay loam and clay sand soils and less frequent on sand and rare in the floodplain. They are also seen in the Indersk mountains on brown undeveloped clay loam soils. *Artemisia terrae albae* pastures are primarily represented by *Artemisia terrae albae*, *Artemisia terrae albae*-ephemers and *Artemisia terrae albae*-*Salsola* species. In the mountains, *Artemisia* occurs together with *Agropyron desertorum*, *Elytrigia repens*, *Stipa sareptana*, *Eremopyrum orientale*, *Poa bulbosa*, and also *Salsola* such as *Ceratocarpus areanarius*, *Climacoptera brachiata*, and ubiquitous *Anabasis aphylla*.

The analysis of the baseline state of the vegetative cover shows that its significant part has degraded as a result of desertification processes caused

mainly by human economic activities. The vegetation gets rarefied, the quantity of floristic species decreases while the number of weeds grows.

The area of Indersk is populated by the following fauna species: mammal - saiga, wild boar, wolf, korsak, fox red, steppe polecat, hare, souslik, jerboa and gerbil; birds - goose, duck, teal, snipe, pigeon; fishes - catfish, pike, pikeperch, sazan, carp, bream, ide, crucian carp, roach and a number of other fishes.

Some species occurring the district are listed in the Red Book such as mammal: piebald shrew and marbled polecat; birds: common egret, glossy ibis, bustard, little bustard, golden eagle, european eagle and black bellied sandgrouse.

Moreover, during migration Black stork, Whopper swan, Red-breasted goose, European white-winged scoter, White-headed duck, Asiatic white crane, Demoiselle crane, Pallas sand grouse, Fish-hawk, Thick-billed plover, Sociable lapwing, Slender-billed curlew, Harrier eagle, and Booted eagle.

To date, the network of health establishments include one central regional hospital, one antituberculosis hospital, two local hospitals, five family medical ambulance stations, three medical and obstetric care points and one medical point, and one regional sanitary-epidemiological station of the second rural category.

The history and culture of Inderskiy district covers the centuries-old period. On its territory many outstanding samples of fine arts can be found which represent the originality inherent only in this region with familiar tendencies of ancient and medieval art of the Caspian countries. Overall, there are 67 monuments of a history and culture.

Amongst them, the Utemisova's mausoleum (1804-1846) and mausoleum of Murat Monken uly (1843-1906) are remarkable. The Siranov's M.monument, obelisk to the heroes of the Great Patriotic War at Eltay, Zeleny, Kulagino and Orlik villages are of historical importance. Archaeological monuments include a single kurgan of the XVIII century at Orlik village, the kurgan group of the VIII century. Moreover, there are the monument of Karabala-Kantemir and of Sultan-Ali and Khonsha mausoleum.

As established by the regional town-building planning, during the construction of some areas it is necessary to apply certain measures for the protection of monuments. Further design should concretise them before the implementation of the design decisions.

### **2.2.2. Air condition**

There are farms and enterprises located on the territory of the Indersky district that produce and process agricultural products. Moreover, there are repair service and other companies dealing with agriculture mechanization, and also companies that extract local construction materials.

Presently there is no adequate and high-quality pollution level control. Therefore, there is a need to establish close control over the emissions and dumping level from stationary sources, and to regulate the construction of

treatment facilities both for cleaning the emitted 'air' clearing constructions and for collector-drainage waters. Moreover, conversion of boiler units from solid and liquid to gaseous fuel is necessary.

Another factor in air pollution is cattle wastes (manure, urine, corpses of dead cattle, etc.).

According to the Indersky district Veterinary Department, cattle epidemics have not been registered for the past several years. The most widespread of the oblast cattle diseases (by local points) are camel contagious abortion and horned cattle tuberculosis.

According to the district's statistical data 0.5% of all cattle were tubercular in 1988. Cattle vaccination and dehelminthization fully provide for a reduction of the morbidity rate. The obligatory utilization and burial of dead cattle would facilitate further reduction of the morbidity rate in addition to vaccination and dehelminthization. Presently, the district's farms don't have no fixed burial sites and burial is done at random. Therefore, the establishment of fixed standard points of utilization and burial of dead and sick cattle is necessary.

Taking into account the character of pollution due to of motor transport emissions in the district, the following conclusions should be made:

Motor transport concentrates in locations with high population density (central manors of farms, urban-type communities, industrial communities, etc.);

Motor transport territorial influence as a farmland pollutant taking into account the future intensity of traffic is insignificant in the district: the maximum is up to 0.41 MPC in a 50-meter zone along the road (Table 2.2.1);

Relatively weak relief ruggedness, absence of big hollows and somewhat average by depth of deposition of water-proof horizon - 6-10 m do not allow the accumulation of lead and other toxic elements in the soil and plants close to the highway;

According to the statistical report data, the hazardous substances emission is equal to 7.2 thousand tons, including carbon oxide – 5.6, hydrocarbons – 1.2, nitrogen oxide – 0.4 in 2000.

Since indirect influence (according to literature data) of lead on plant associations and animals is seen from 0.45 MPC, it could be noted that the influence of motor transport along the highways is not significant in the district.

Presently, the main sources of man caused Indersky district air pollution by indexes of emissions from stationary sources limits for Indersky district are obujets of oil and gas transportation, heat-and-power sources and transport (Table 2.2.2).

The main sources of air pollution among these are the Oil Pumping Station (OPS) "Inder" and Line production management of main pipelines "Zhaiyktrahns gas-Inder".

**Calculated divisible MPC indexes of lead in the soil along the highways of Indersky district (up to 2005)**

Highway name	Traffic intensity, vehicles/day		Calculated indexes of lead at a distance from the highway, mg/rg				
	2000	2005	50 m	100 m	300 m	500 m	1000m
Atyrau-Uralsk	2691	4026	0,41	0,36	0,27	0,26	0,25
Atyrau -Indeborsky	1676	1914	0,2	0,17	0,13	0,12	0,12
Indeborsky -Karatau	255	394	0,04	0,04	0,03	0,02	0,02
At the entrance to Indeborsky	394	610	0,06	0,05	0,04	0,04	0,04
Motorways of Jambul farm	261	404	0,04	0,04	0,03	0,03	0,02
Motorways of Indersky farm	129	200	0,02	0,02	0,01	0,01	0,01
Inderborsky-Sarman	4	6	0,0	0,0	0,0	0,0	0,0
When MPC of lead in the soil is 10 mg/kg							

### 2.2.3. Surface and ground water

Resources of Indersky district surface waters are represented by the transit drains incoming from the West-Kazakhstan oblast by the Ural River. The Ural River flows in the district's area from the north to the south and divides the area in half without receiving supplementary replenishment.

Local drain is formed in the basins of small temporary currents and observed in the broad gullies only during the spring.

The whole range of first from the surface water-bearing horizons or water associations in the sea – New Caspian and Khvalinian, and continental – sore, alluvial, lacustrine-alluvial-deltoid deposits can be distinguished in the flat plain of the Ural River. The recharge of all horizons is mainly realized due to atmospheric precipitation, and less due to the floodwater and seepage from the other horizons.

The first surface water-bearing horizon within the limits of oblast is known in the modern alluvial deposits, New Caspian sea deposits and Khvalinian sea deposits. Ground waters are formed in a typical arid zone at the expense of atmospheric precipitation seepage and regional inflow of underground waters from the Ural-Mugodjar upland-folded region. A surface fresh water of the Ural River and its tributary, and weakly mineralized ground waters of the first of a surface water-bearing horizon dated to modern alluvial deposits play the main role in the water supply of the oblast.

Table 2.2.2

### Indexes of pollutants proportion from stationary sources in the area of Indersky district in 1995-1997 and 1999

#	List of enterprises – natural resources users	MPE	TAE	Including by ingredients										
				Nitric oxide	Carbon oxide CO	Sulfurous anhydride	Unsaturated hydrocarbon/Petrol	Solid substances (soot, ashes, dust)	Sulphurated hydrogen/oxide sulfur	Ammonia	Phenol/xylene	Benzapilene, benzol	Saturated hydrocarbon	Other
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
				1995										
1.	OPS «Inder»	11,9	-	0,45	0,01	0,02	11,42	-	-	-	-	-	-	-
2.	OPS «Eltai»	-	1,73	0,25	0,78	-	-	0,35	-	-	-	-	-	0,7
3.	RBA-38 Inder	86,37	-	4,35	18,73	14,08	0,22	48,99	-	-	-	-	-	0,1
4.	Indersky District motorway	11,46	-	0,2	0,8	0,6	0,2	9,66	-	-	-	-	-	-
5.	Indersky MTE	1,7	-	0,11	-	-	0,2	0,01	-	-	-	-	-	1,39
6.	Boiler-house of farm “Put Ilyicha”, Zeleniy village	16,88	-	2,29	7,85	5,88	-	0,84	-	-	-	-	-	0,02
7.	Boiler-house “Amangeldy”, Gory village	26,44	-	0,66	11,44	2,88	-	11,42	-	-	-	-	-	0,04
8.	Boiler-house of farm “Pravda”, Kulagino village	9,18	-	1,06	4,55	3,35	-	0,13	-	-	-	-	-	-
9.	Boiler-house of Indersky RBA Agropromtrans, Kulagin village	8,21	-	1,05	4,1	2,94	-	0,12	-	-	-	-	-	-
10.	Company PTD DAU Kulagino village	8,21	-	1,05	4,1	2,94	-	0,12	-	-	-	-	-	-
11.	Boiler-house of Jambul farm	50,2	-	2,6	7,1	7,5	-	33,0	-	-	-	-	-	-
12.	Boiler-house of farm “Amangeldy”, Eltai village	12,19	-	3,05	9,14	-	-	-	-	-	-	-	-	-
13.	Boiler-house of Inder village utility	10,78	-	2,8	8,09	-	-	-	-	-	-	-	-	0,01
14.	Experiment-industrial company “Indersol”	4,52	-	1,16	2,1	1,17	-	0,07	-	-	-	-	-	0,02

Table 2.2.2 continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
15.	Boiler-house of farm “Peredovik”, Orlik village	184,42	-	8,14	20,37	28,98	-	126,9	-	-	-	-	-	0,03
16.	Boiler-house of Indersky MMD-6	6,98	-	0,83	3,33	2,54	-	0,26	-	-	-	-	-	0,02
17.	“Pravda” farm	42,57	-	16,79	14,47	8,3	1,83	0,2	-	-	-	-	-	0,57
18.	Indersky borate mine of JSC “Dender”	3,86	-	0,24	0,87	-	-	2,75	-	-	-	-	-	-
19.	Inderk Water System Administration, Kulagino village	0,53	-	0,13	0,4	-	-	-	-	-	-	-	-	-
20.	Inderk PDEU (area #2)	1,71	-	0,19	0,92	0,6	-	-	-	-	-	-	-	-
21.	FMS Inder. Indersky LPMMP, Public enterprise “Zhaiyktransgas”	-	-	2982,94	946,34	-	113,97	-	-	-	-	-	-	0,8
22.	Boiler-house of Kulagino village utility	60,11	-	3,07	6,99	11,95	-	38,1	-	-	-	-	-	-
	TOTAL:		4604,65	3033,39	1072,48	93,73	127,84	272,92	-	-	-	-	-	3,6
1996														
1.	JSC “Atyrauzholardy” Indersky Road Administration	97,7118	-	4,52	19,52	14,67	-	Wood dust -9,52; dust-48,99	-	-	-	-	0,424	0,06 78
2.	JSC BNU Inder OPS	83,588	-	28,524	30,249	4,775	0,8368	Soot – 0,664	-	-	-	-	Methane - 18,422	0,11 8
3.	LPMMP «Zhaiyktransgas»	-	62524,69	2983,06	-	-	0,535	Methanol – 0,225	-	-	-	-	Methane – 76,736	0,00 95
4.	SE «Kamkorshy», boiler-house	6,82	-	0,87	3,4	2,45	-	0,1	-	-	-	-	-	-

Table 2.2.2 continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
5.	JSC «Inder-Kramdskurylys»	7,69833	-	1,2096	4,34616	1,75616	0,05766	Soot – 0,0288; Inorgan. dust – 0,3366	-	-	-	-	-	0,00345
6.	Inder Trade Union	6,7	-	0,25	3,73	0,62	-	2,11	-	-	-	-	-	-
7.	JSC «Denderbor»	-	44,9	10,48	23,18	0,77	-	10,47	-	-	-	-	-	-
8.	Bread-baking plant boiler-house	5,336	-	0,07	3,619	0,131	-	Soot – 1,578	-	-	-	-	-	-
9.	CFB «Kzylzhar»	9,42	-	2,52	6,9	-	-	-	-	-	-	-	-	-
10.	JSC «Indertuz»	4,6	-	1,17	2,1	-	-	0,08	1,18	-	-	-	-	-
11.	CFB «Amangeldy»	38,59	-	3,78	19,64	2,88	12,36	-	-	-	-	-	-	-
12.	CFB named after Mahambet	12,57	-	0,5	5,74	2,72	1,07	0,95	-	-	-	-	-	-
13.	CFB «Naryn»	-	14,62	3,54	10,62	-	-	-	-	-	-	-	-	-
14.	CFB «Kostugai»	17,52	-	2,32	8,36	5,88	0,09	0,84	-	-	-	-	-	-
15.	JSC «Esbol»	20,87	-	2,95	10,47	6,79	-	0,53	-	-	-	-	-	-
16.	Water system administration	1,38	-	0,17	0,69	-	-	0,02	-	-	-	-	-	-
17.	JSC «Arna»	6,75	-	0,84	3,34	2,55	-	0,26	-	-	-	-	-	-
18.	PPTO «Agropromtechnica»	8,21	-	1,06	4,1	2,94	-	0,12	-	-	-	-	-	-
19.	MTE «Kulagino»	8,21	-	1,06	4,1	2,94	-	0,12	-	-	-	-	-	-
20.	Inder Utility services association	10,78	-	2,58	8,96	-	-	-	-	-	-	-	-	-
21.	MPOO «Bor»	18,56	-	2,67	8,65	6,57	-	0,67	-	-	-	-	-	-
22.	STVS-8	0,38	-	0,27	0,08	-	0,03	-	-	-	-	-	-	-
23.	District cooperative society								There is no limit of MPE and emissions permission					
						1997								
1.	JSC «Atyrauzholdary» PRBA-4			1,106	4,753	3,02	0,294	Wood dust – 130,29; Soot – 0,365	-	-	-	-	-	2,0

Table 2.2.2 continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2.	JSC BNU Indersky OPS			28,524	30,249	4,775	0,8363	Soot – 0,664	-	-	-	-	Methane – 18,422	0,118
3.	LPMMP «Zhayiktransgas»			2983,06	946,66		58218,7	-	-	-	-	-	Methane – 76,736	0,385
4.	SE «Kamkorshy»			2,2	3,59	9,5		38,0	-	-	-	-	-	--
5.	SE «Kamkorshy», boiler-house			0,87	3,4	2,45	-	Soot – 0,1	-	-	-	-	-	-
6.	JSC «Inder-Kramdskurylys»			1,2	4,35	1,76	0,06	Dust – 0,31	-	-	-	-	-	-
7.	Bread-baking plant, boiler-house			0,07	3,619	0,131		Soot – 1,51	-	-	-	-	-	-
8.	JSC «Inderbor»			10,48	23,18	0,77		10,47	-	-	-	-	-	-
9.	CFB «Kzylzhar» (no permission)			2,52	6,9	-	-	-	-	-	-	-	-	-
10.	JSC «Indertuz»			1,17	2,1	1,18		0,15	-	-	-	-	-	-
11.	JSC «Adlet»			3,78	19,64	2,81	12,36	-	-	-	-	-	-	-
12.	CFB named after Mahambet			0,5	5,74	2,72	1,07	0,95	-	-	-	-	-	-
13.	CFB «Naryn»			3,54	10,62	-	-	-	-	-	-	-	-	0,46
14.	CFB «Kostugai»			2,32	8,36	5,88	0,09	0,84	-	--	-	-	-	0,33
15.	JSC «Esbol»			16,797	14,478		1,83	0,203	-	-	-	-	-	0,002
16.	Water system administration «Daupaz» (no permission)			0,17	0,69			0,03	0,49	-	-	-	-	-
17.	JSC «Arna» (no permission)			0,81	3,34	2,55		0,02	-	-	-	-	-	-
18.	PTD «Agropromtehnika»			1,06	4,1	2,94		0,11	-	-	-	-	-	-
19.	MTE «Kulagino»			1,05	4,1	2,97		0,09	-	-	-	-	-	-
20.	«Indermezhraigaz»			0,534	0,203	0,05	72,57	0,558	-	-	-	-	-	0,048
21.	Filling station «Koshanov»						0,6059	-	-	-	-	-	-	-
22.	JSC «Ak zhaiyk»			10,73	26,91	11,39		12,58	-	-	-	-	-	-

Table 2.2.2 continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						1999								
1.	JSC «Tulpar» (no permission)			1,05	4,1	2,97		0,09	-	-	-	-	-	-
2.	JSC «Arna»			0,84	3,34	2,55		0,02	-	-	-	-	-	-
3.	JSC «Agropromtehnika»			1,06	4,1	2,94		0,11	-	-	-	-	-	-
4.	JSC «Inderbor»			0,24	0,8			2,75	-	-	-	-	-	-
5.	CFB «Kzylzhar» (no permission)			2,52	6,9	-	-	-	-	-	-	-	-	-
6.	JSC «Indertuz» (no permission)			1,17	2,1			0,08	1,18	-	-	-	-	-
7.	PC «Adlet» (no permission)			3,78	19,64	2,88	12,36	-	-	-	-	-	-	-
8.	JSC «Zharsuat»			1,04	2,71	1,12	1,43	0,43	-	-	-	-	-	0,06
9.	Rural district «Kokturgai» (no permission)			2,32	8,36	5,88	0,09	0,84	-	-	-	-	-	0,33
10.	JSC «Esbol» (no permission)			16,797	14,478		1,83	0,203	-	-	-	-	-	0,002
11.	Filling station «Birlik»						0,09	-	-	-	-	-	-	-
12.	PE «Sultan»						0,09	-	-	-	-	-	-	-
13.	KFK «Islam»						0,299	-	-	-	-	-	-	-
14.	«Indermezhraigas» (no permission)			0,534	0,203	0,05	72,57	0,558	-	-	-	-	-	0,048
15.	Filling station «Koshanov»						0,6059	-	-	-	-	-	-	-
16.	Filling station Orlik village						0,23	-	-	-	-	-	-	-
17.	Filling station Inder						0,39	-	-	-	-	-	-	-
18.	Filling station Kairanbayeva						0,29	-	-	-	-	-	-	-

The depth of ground waters deposition does not exceed 6 m in the valleys of the Ural River channels (Table 2.2.3).

The character of the ground waters' natural condition is shown by hydro-geological areas detailed on a zoning map based on circumstances of the formation conditions.

The studied regions have common similar features and correspondingly the ground waters conditions have unequivocally directive characters, based on a number of geolithologic, hydro-geological and meteorological characteristics.

The determining geomorphological characteristics for the conditions of ground waters recharge and discharge, and consequently for the formation of their balance are the following: the area elevation, lithological structure of aeration zone rocks, physical properties of aeration zone rocks, area relief, etc.

There are the following areas by conditions type due to geomorphological differences within the region: interfluvial, terraced, and streamside.

#### **2.2.4. Subsurface and geological environment condition**

The district territory, with regard to geomorphology, belongs to the Pre-Caspian accumulative high-quaternary seaside, and here and there to alluvial lowland marginal trough of a platform with residual sea salinity and partial ashy modelling. In its relief character it represents flat plain consisting mainly of sandy and partly loamy high-Khvalinian deposits and of clay in the east. The largest sandy association, the Ryn-sands, occupies the western part of the district. The Indersk elevation (up to +52 m of absolute height) towers in the north as a set of large hydrochloric domes formed from the upthrust of deep deposits of potash salt. Along the Ural River the alluvial plains can be observed. The river's flat plain has numerous flat and wide degradations, channels. The terraces, varying between 1 and 6 km in width are stretched along both sides of the Ural River. There are numerous solonchaks, soras and takyr in the east of the district. Absolute heights on the larger area vary from 0-20 m below sea level. The ruggedness of ravine-joist networks area is equal to 0.03 km/km<sup>2</sup>, depth of local base level is 12 m, and the average slope of catchment is less than 10.

The relief of the district favors the development of sheep and camel-breeding. Hayland and irrigated lands are confined to the Ural flat plain.

The deposits of Kungurian stage of lower Permian are the most ancient rocks within the Inderskiy district. They are represented by a great thickness of homogeneous formations close to the surface in the salt domes nucleus. Their initial capacities are distorted by salinedome tectonics.

High-Permian and Triassic deposits are mostly developed in the interdome depressions. They are represented by multicolored and mainly terrigenous shallow deposits.

Table 2.2.3

**Annual average long-term levels of ground waters in conditional wells in the Ural River valley  
(in meters from ground surface)**

Post and well name	Years										
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Inderskiy											
292a	5,19		5,09	4,28	3,95	4,58	3,47	3,21	4,08	4,80	4,91
293a	5,51		5,62	4,80	4,33	5,21	3,76	3,28	4,60	5,46	5,66
294a	5,48		5,66	4,76	4,61	5,54	4,20	3,87	5,14	5,88	5,93
Makhambetskiy											
165	2,67	3,24	3,45	2,78	3,10	4,25	4,00	3,54	3,75	3,61	3,80
164	1,82	2,10	2,70	2,22	2,63	4,10	3,44	3,33	5,31	5,49	6,00
154	5,50	5,33	5,98	5,04	4,85	5,84	4,93	3,45	4,81	5,72	5,96
149	2,56	2,58	3,37	2,97	2,74	4,21	3,43	3,09	5,58	5,81	5,66
Tendyk village											
1	1,27	1,23	1,59	1,18	1,05	1,27	1,08	1,49	1,68	1,87	2,01
2	2,36	2,16	2,17	1,73	1,74	2,18	1,67	2,12	1,67	1,41	1,91
21			3,06	2,70	2,58	2,65	2,44	1,88	2,26	2,54	2,68
Peshnoi											
209	2,39			0,61	0,40	0,22	0,13	0,33	Filled	0,20	0,29
146	Filled				1,45	1,24	1,11	0,71	"-"	1,47	1,22
147	Nonexistent				2,31	1,90	1,74	1,44	"-"	1,81	1,82
148	"-"				0,45	1,53	1,49	1,02	"-"	1,57	1,60

Usually continental and seaside deposits of Jurassic system come out on Pre-Pliocene surface in the arch and pre-arch parts of salt domes.

Seaside terrigenous formations of the lower part of the cretaceous system are developed in pre-arch parts of salt domes. High-cretaceous sea carbonate deposits compose the peripheral parts of the salt domes' wings. The palaeogene deposits in interdome depressions cover them.

The palaeogene deposits that are represented by sea terrigenous formations compose mainly interdome depressions. The multicoloured continental formations conditionally attributed to Miocene are sporadically developed. They fill erosive hollows of an ancient relief.

Pliocene is represented by high layer – coastal terrigenous formations of the Akchagyl and Apsheron stages.

Quaternary deposits are represented by Bakinian, Khazarian and Chvalynian formations. Alluvial formations are insignificantly developed.

Modern continental deposits are represented by alluvial, lacustrine, lacustrine-alluvial formations of insignificant thickness.

**Kungurian stage deposits of lower Permian (P<sub>1</sub>kg)** are subdivided into three thicknesses (from bottom to top): salt, sulphate and terrigenous.

Salt thickness is represented by rock salt with underlying seams of anhydrites, kieserite- anhydrites rocks. The salt is transparent, white, gray from micro- to macrocrystalline.

Sulphate thickness is represented by gypsum and anhydrites with underlying layers of terrigenous and carbonate rocks. Gypsum and anhydrites are gray, massive and thin-layered from cryptocrystalline to macrocrystalline.

Terrigenous thickness is composed of dark-gray to black strongly carbonated sandy clays with layers of gray brecciated limestones, dolomites, sandstones. Water-containing are terrigenous as well as sulphate thicknesses of a given age.

Total opened thickness of the Kungurian stage is equal to 1547 m.

High-permian rocks of **Kazanian stage (P<sub>2</sub>kz)** lie in the hollows of a washed surface of salt massif on Kungur thicknesses. They are represented by waterproof brick red, brownish-red and greasy-textured clays. Carbonate clays differ by significant density and the absence of cleavage.

The Kazanian stage deposits thickness on the Chelkar dome varies from 2 and up to 30 m.

The trias deposits lie with washout on high Permian and some Kungur deposits. Moreover, there is a some white limestone pebbling in their basis. Two packs of rocks are distinguished: the lower is green colored and the top one is multicolored.

The trias deposits thickness on domes reaches 70 m. According to the seismic data it reaches 700-1500 m in interdome depressions.

The lias-dogger deposits lie on the washed surface of trias or, more commonly, Kungur formations. Rocks are not the same everywhere, in the lower part of deposits sands prevail more often, and clays are prevalent higher up.

Clays are gray and dark gray to black, greenish- and brownish - gray, non-carbonate, sandy.

The sands with the most significant (up to 10 m) layer thicknesses vary from light to dark gray, quartz- micaceous, slightly loamy, fine-grained.

The maximum thickness of lias-dogger deposits reaches 435 m.

Callovian and Volgian stages are located among the White Jura deposits where they are fully penetrated by wells.

The **Callovian stage** with washout lie on the dogger formations. A phosphorite horizon can be observed in their base. There is a layer of gray-greenish, quartz sandstone here and there on the contact. Gray and light gray with a greenish tint clay lie higher.

The Callovian stage thickness equals 15 m.

The **Volgian stage** deposits lie on a washed surface of dogger and occasional Callovian formations.

The Volgian stage is represented by dark gray, almost black carbonate clays with layers of chartreuse combustible slates (up to 0.1 m) and gray aleurolites (up to 0.5 m).

The general thickness of these deposits is equal to 167 m.

The deposits of both parts of Cretaceous are developed on the studied area.

**The Neocomian over stage (K<sub>1nc</sub>).** Deposits lie on a washed surface of low-Volgian stage deposits. They are represented by clays with thin layers of sands, sandstones and aleurolites. Rocks are mainly light colored (gray, light gray, greenish-gray). Clays are non carbonate, aleurolite, and sometimes greasy in texture.

Sands are fine-grained and sometimes carbonate.

The total thickness of the Neocomian stage is equal to 85 m.

**The Aptian stage deposits (K<sub>1ap</sub>)** lie on a washed surface of Neocomian rocks. They are represented by dark gray and black clays with rare bands of dark gray aleurolites. Clays are non-carbonate, aleurite, micaceous, layered and sometimes argillite-like.

The maximum thickness of this stage's deposits is equal to 148 m.

**The Albian stage deposit (K<sub>1al</sub>)** are represented by gray and dark gray to black, noncarbonate, layered with powders of aleurolites clays. There are yellow-green-grayish fine-grained quartz sands (7-7.5 m) containing grains of glauconite clays in the uppermost part of Albian.

The total thickness of Albian stage deposits reaches 183 m.

**The Cenomanian stage deposits (K<sub>2s</sub>)** are represented by dark gray, black, brownish and brown clays that usually have a greenish tint in result of glauconite consistency. The maximum thickness of Cenomanian deposits is equal to 27 m.

**The Turonian-Coniacian stage deposits (K<sub>2t-k</sub>)** lie on a washed surface of Cenomanian or Albian deposits. Light green, gray, white and grayish-white, chalk-like marls, and also very dense and solid limestones with a sharply angular fracture represent them. The maximum thickness of deposits is equal to 24 m.

**The Santonian stage deposits (K<sub>2st</sub>)** are usually composed of white dense chalk with rare bands of greenish-gray carbonate dense bogen clay. The full thickness of these deposits is 88 m.

**The Campanian stage deposits (K<sub>2cp</sub>)** are represented by light gray, greenish-gray or greenish-white and white carbonate clays, chalk-like marls and

less often by chalk. The maximum thickness of Campanian deposits is equal to 120 m.

**The Danian stage deposits (K<sub>2d</sub>)** lie on a washed surface of Maastricht rocks and are represented by grayish-white and very solid organogenic limestones that contain fragments of derived chalks or pebbles of phosphorites and silicon in the foundation. The thickness of Danian limestones varies from 3 to 6 m.

Two parts can be distinguished among the palaeogene deposits: Palaeocene and Eocene.

The Palaeocene deposits lie on an uneven and washed surface of Danian limestones.

The Palaeocene is composed of siliceous rocks: clays that contain opal, gaudes, claystone that replace each other based on the length of occurrence. The maximum thickness of Palaeocene deposits is equal to 84 m.

The following Eocene rocks transgressively overlap above the Palaeocene claystones: solid, conchoidal, greenish-gray sandstones; dark gray, sandy claystones; dark gray, greenish clays that are interlaid with fine-grained, glauconitic-quartz sandstones; and yellowish, gray, quartz sands. The total thickness of deposits is 230 m.

The Neogene deposits are represented by Miocene and Pliocene.

The Miocene deposits are observed in outcrops on the Sasai height (the arch's northern part of the Chelkar dome) and opened by numerous wells on different sides of the Chelkar dome arch.

The Miocene deposits are represented by multicolored clays with pinching-out and irregular-shaped bands (up to 35 m, more often 1-3 m), and inclusions of sand and sandstones. The maximum thickness of Miocene rocks is 218 m.

**The Akchagyl stage (N<sub>2ak</sub>).** The deposits of this stage with a sharp angular and erosive discord on rocks of various age: from Kungurian to Oligocene and transgressively on Miocene.

Studied deposits are represented by carbonate clays with underlying lenticular bands of sands of up to 15 m thickness, siltstones and less often limestones - coquinas. The clays are usually gray, bluish- and greenish-gray, aleurite.

The thickness of Akchagyl deposits varies within very wide limits at a general tendency of its increase in the southern direction from 20 to 230 m.

The deposits of quaternary system are represented by coastal low- and medium-quaternary, high-quaternary sea and continental, and modern formations.

**The Apsheronian stage (N<sub>2ap</sub>).** These deposits are represented by carbonate clays with lenticular bands of pelitic and medium-grained sands, siltstones, aleurite, sandstones and loams. The clays are bluishly-greenish- and light gray, aleurite, micaceous with conchoidal fracture. The thickness of Apsheronian deposits increases in the southern direction from 20 to 120-140 m.

**The sea deposits of Bakinian transgression (Q<sub>1b</sub>)** lie on a washed surface of the Apsheronian rocks and less often of the Akchagyl. Moreover, on the Sasai height they transgressively overlap uneven-aged formations.

The Bakinian are represented by yellowish-brown and brownish, fine and medium-grained, quartz sands with bands of brownish and brown clays. The thickness of the Bakinian deposits usually vary from 5 to 15 m.

**The sea deposits of Khazarian transgression (Q<sub>IIhz</sub>)** are uncovered on the right coast of the Ural River close to the villages of Budarinsky and Kozhekharonsky and passed by most of the wells here. They lie on a washed surface of Bakinian and, less often, Apsheronian and Akchagyl deposits.

The Khazarian deposits are represented by gray sand with brownish or greenish tints, arenaceous clays with rare low-powered bands of gray anisometric polymict sands. The thickness of the studied deposits increases in the southern direction from an absolute absence above the Chelkar and Santes domes' arches and up to 21-23 m above the Baranovsky and Goryachnesky domes' arches. The thickness of sea low-quadernary deposits varies from 15 to 35 and more meters on average. The low horizon - low layers - sea deposits of maximum spread period of the low-Khvalinian sea reach up to the level of 49 m (Q<sub>IIIhv1a</sub>) and middle layers - sea deposits of receding sea stoppage period of low-Khvalinian sea reach levels of about 20 m (Q<sub>IIIhv1b</sub>).

Low-Khvalinian deposits are represented by clays, sands, loams, sandy loams, and loamy sands, however, the clays and sands are usually dated to the lower part of open-cast. The thickness of low-Khvalinian deposits increases in the southern direction from 2 to 15 m.

The higher horizon - lower layers are continental deposits (Q<sub>III2a</sub>). Higherkhvalinian transgression reached only to the territory of sheet M-39-XVI and continental deposits of time of its maximum extension compose the second terrace above the flood-plain of the Ural River. It is mostly developed on the left bank, and is observed on the right bank of the Ural River only in very small areas. The thickness of alluvium does not exceed 3 m.

Modern deposits are represented by continental formations of a various origin.

**Alluvial deposits** of the rivers Isenankaty, Tulakanty and Solyanka flood-lands are represented by yellowish-gray sands, sandy loams and loams. Their thickness does not exceed 4 m.

**Lacustrine-alluvial deposits** fill out beds of numerous channels, former river-beds, other lowerings within the erosive delta of the Ural River. They are represented by gray and dark gray clays that sometimes have a bluish tint with ochreous spots of ferruginization and less often yellow-brown loams with bands of fine-grained sands.

**Alluvial deposits of the Ural River valley. Alluvium of the lower horizon (aQ<sub>IV<sup>1</sup></sub>)** composes the first above flood-plain terrace which is traced along the whole Ural River valley on both banks and is represented by sand, sandy loams and loams. The sands are usually dated for the lower part of alluvium. Sands are yellowish-gray, quartz, pelitic and fine-grained. Total thickness does not exceed 9 m.

**Alluvium of the higher horizon (aQ<sub>IV<sup>2</sup></sub>)** composes a high flood-plain of the Ural River and is represented by sands that are usually dated to the lower part of

deposits, sandy loams and loams. Sands are grayish-brown, quartz, fine-grained. Total thickness does not exceed 6 m.

**Higher bands of the modern Alluvium (Q<sub>IV</sub><sup>2B</sup>)** compose low flood-plain of the Ural River and are represented by grayish-yellow, fine- and medium-grained, polymict sands. Total thickness does not exceed 1-1.5 m.

## **Tectonics**

Tectonic pattern of the area is determined by its location in the Pre-Caspian syncline. Its fundament is the southeast and deeply undergrounded margin plate of the Russian platform.

Generally, a deep deposition of the Precambrian crystalline foundation, development of a strong sedimentary formation cover and general spreading of salt tectonics is typical for the Pre-Caspian syncline.

Four differently dislocated geotectonic layers can be distinguished in the sedimentary cover: subsalt palaeozoic, salt Kungurian, past salt high-Permian-palaeogene and integumentary Neogene-Quaternary.

Subsalt palaeozoic geotectonic layer is studied only on the basis of seismic data. According to the seismic horizon character, it can be posited that past salt deposits are covered by wide flat flexures with steep slopes turned to the center of the syncline.

Salt (Kungurian) geotectonic layer. Maximum immersion of the subsalt layer in the northern and western parts of the syncline has become a reason for the development of greatest salt thicknesses, which have experienced intensive plastic deformations under the pressure of higher layers deposits, resulting in the formation of the largest and high elevated salt lands here.

Past salt geotectonic layer is involved in the construction of salt domes and its tectonics are reflected of different growth stages and the formation of salt lands. Therefore, two geotectonic layers are involved in the construction of salt domes: salt Kungurian and past salt high-Permian- palaeogene.

Integumentary Neogene-Quaternary layer. Detailed study of Neogene-Quaternary deposits has shown their weak dislocation. Local tectonic forms of elevation and immersion have appeared under the influence of salt tectonics in the integumentary geotectonic layer.

### **2.2.4.1. Minerals**

The mineral resources base adjacent to the village of Inderborsky is represented by a wide variety of boric minerals (98 deposits of Inderborsky group) including calculated deposits of magnesium, potash and rock salts. Beyond the association of Inder group boric minerals deposits, chalk deposits have been explored, such as White Rostosh at three areas: Inderborsky deposit of gypsum, Inderborsky and Inder deposits of rock-salt (Figures 2.2.1, 2.2.2).

The boric minerals deposit develops among the listed types of deposits and remaining deposits are reserve-explored. Chalk, gypsum, rock salt deposits are significant and their reserves will provide for long-term production.

Preliminary exploration of lacustrine brine Indersky deposit was conducted in 1982-1988 on the territory close to the Inder lake. Results indicated the possibility of constructing a salt mine on the basis of lake-salt with productivity of 3 mln. tons a year. It was determined that there are valuable components in the Inder lake interstitial brine such as boron and bromine etc. that have industrial concentrations. There are also such rare elements as lithium and rubidium in the brine. The deposits of potassium, magnesium, boron oxide, bromium and sodium chloride were calculated. Detailed exploration of this area, yielding further confirmation of industrial resources, has been conducted.

The rock salt and chalk deposits in the area of Inder Lake indicated the need to build a soda plant there.

Indersky deposit of rock salt (resources for the soda industry) is represented by a thick salt deposit. The rock salt within the exploratory wells outline is mostly composed of halite (NaCl). The resources were calculated by C1 in the amount of 397,0 and C2 – 709,0 mln. tons.

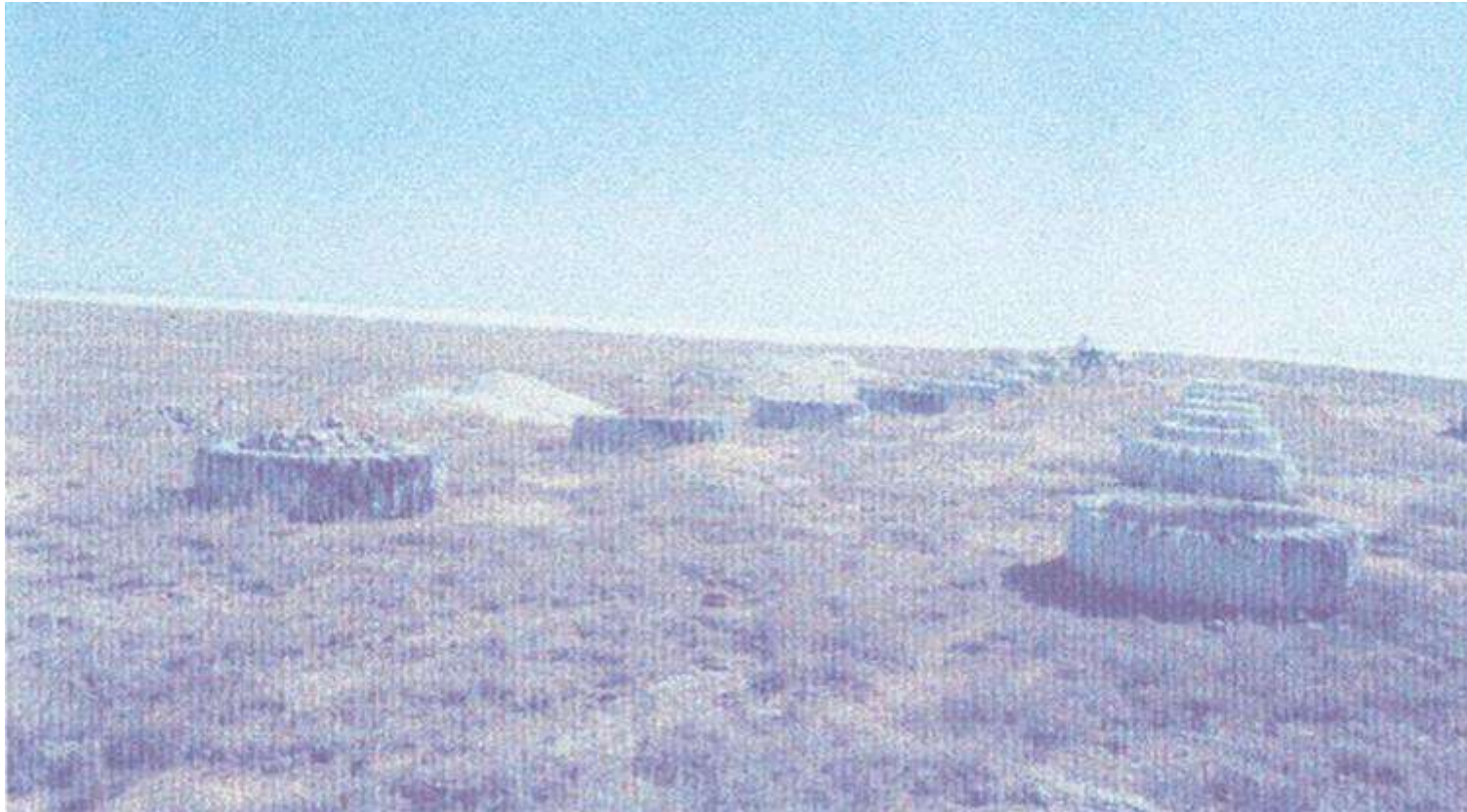
Indersky deposit of chalk (Belaya Rostosh) is located directly close to rock salt deposit (Belaya Rostosh gully). The Santonian stage deposits (K2st) are raw materials for the soda industry that are represented by slightly loamy chalk.

The Indersky gypsum deposit is dated to the southwest part of the Indersky salt dome elevation. The middle-Jurassic and Quaternary stage deposits are involved in the geological structure of the deposit. The overburden thickness varies from 0.4 to 2.7 m and the thickness of the useful layer is 11.4 m. Gypsum deposits are represented by solid rocky differences with fine- and less often with medium- and macro-grained structure. The gypsum is of all-Union State Standard 125-41, 125-70, 4746-49 quality and useful for the production of foundry, construction and medical gypsum. There was 7527 thousand of tons of gypsum, based on the A+B+C1 balance listing, as of 1.01.1978.

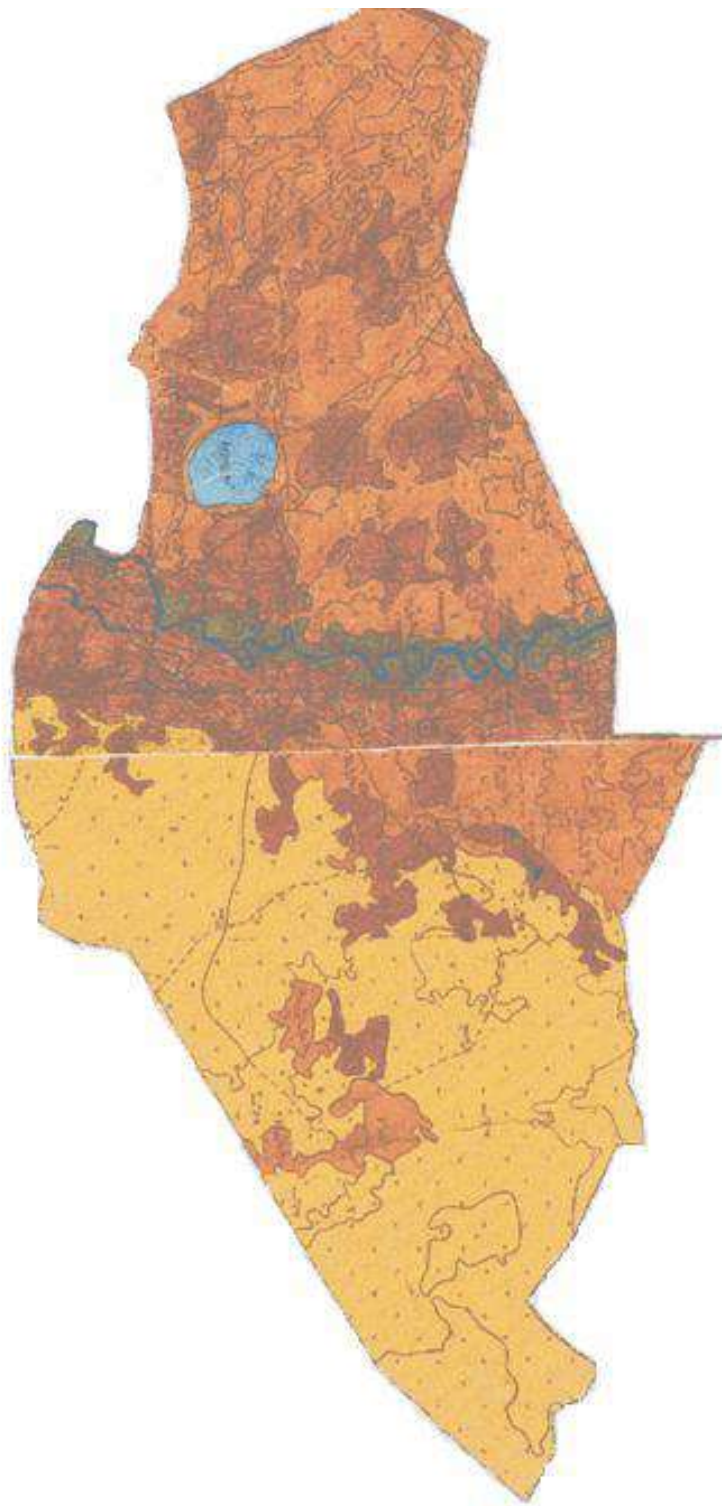
The resources of gypsum rock were calculated in the overburden of Indersky borate deposit #98; by industrial categories they amount to B - 2919 thousand of tons, C1 – 12199 thousands of tons. Gypsum rock of the deposit is useful for the production of cementing materials that can be used for production of dry plaster mixtures, mixtures for self-ventilated floors, claydite-concrete blocks. Favorable mining-technical conditions for development, heavy stocks, high quality of the raw materials and deposit location in conditions of well-managed development of mining-extraction industry show significant potential for its industrial exploration.



**Figure 2.2.1 Open-cast mine of borate minerals extraction in the Inder**



**Figure 2.2.2 Museum in steppe (Kunaev D.A.) in the Dimash-Tobe.  
The Indersky rayon minerals' samples are exhibited here**



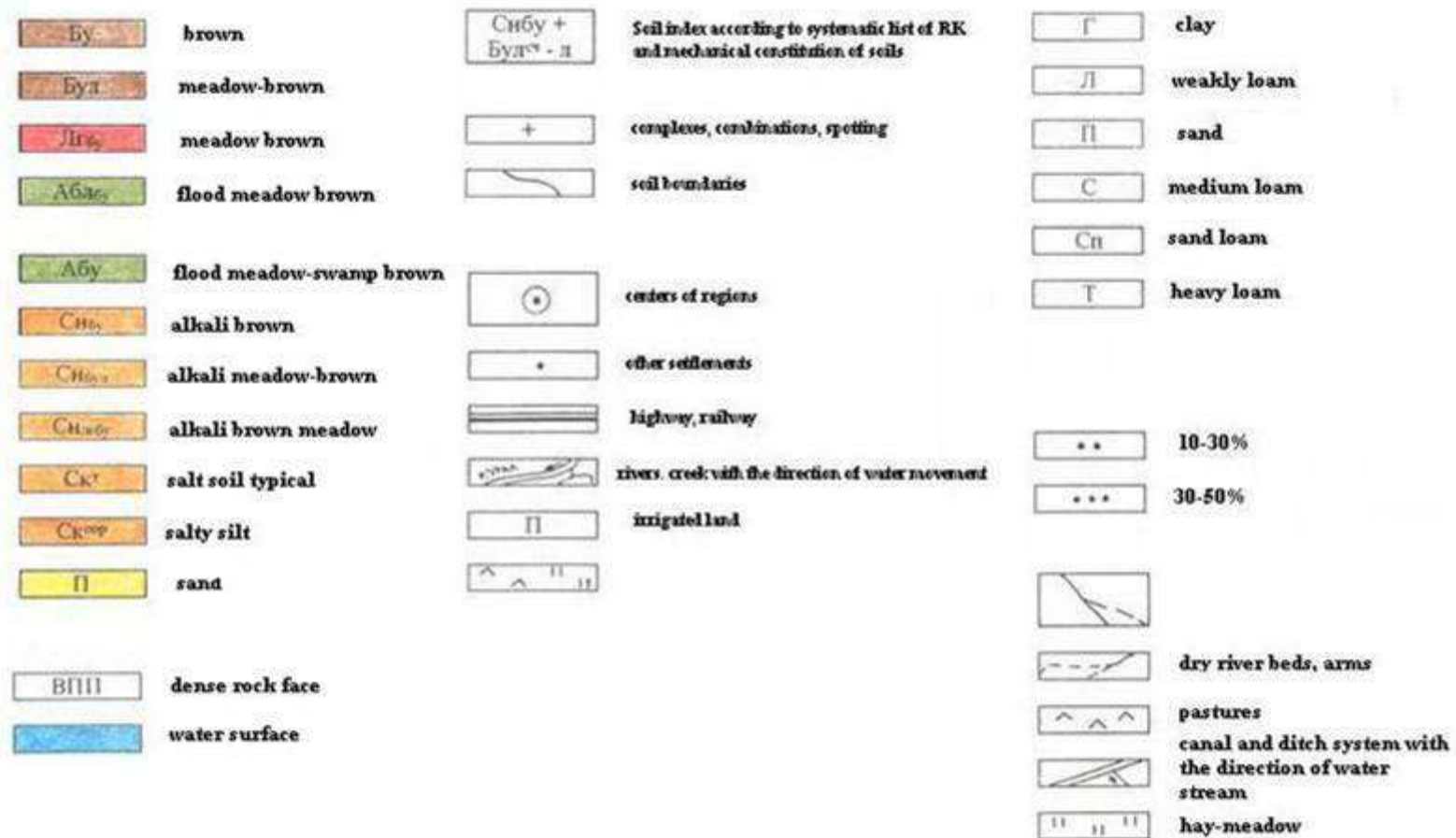


Figure 2.2.3 Soil map of Inder region

98 deposits of Indersky group were accounted by boric minerals resources balance. Alluvial deposits of borates in the cap rock of the Indersky dome have been exploited by open-cast mines of the Indersky borate mine since the mid - 1930s, i.e. practically as soon as they were discovered. Boric minerals of the Indersky group are related to the large deposit of halogen type. The salt thickness is the mother bed of boric minerals. Accumulation of the boric mineral is dated to the residual soil (gypsum hat) and to salt thickness. Boric minerals are also found in the composition of the ground waters and interstitial brine of the Inder lake.

Minerals with a content of 15% and more of the boric oxide are practically exhausted. The reserves of so called “ordinary” (9-12%) and poor (6-9%) minerals are sufficient for 20-25 years production under stable conditions. Here, the mineral resources of the gypsum Inder hat are exhausted. Further, the extension of the mine with attraction of borate minerals of the Satimolinsky deposit (West-Kazakhstan oblast) is considered for the growth of production. The deposit was opened in 1964, its reserves were confirmed by the USSR SRC by the sum of categories B+C1 (protocol № 9951 as of 1.04.1986). The total term of the deposit Satimola development is 40 year.

### **2.2.5. Soil landscape condition**

According to the natural-agricultural plan of zoning and use of available land of the Republic of Kazakhstan, the area of Indersky district is related to the desert zone of the Aral-Caspian province where the major background is composed of brown soils. The feature of the soil landscape is the distinct complexity of intra-zonal soils (floodplain solonetzic, meadow saline, solonetz, solonchaks) (Figure 2.2.3).

The character of land quality that was implemented by the Complex-Exploratory Department of the “Kaziprozem” Institute, a systematic list of soils and an inventory of materials on irrigated lands were produced on the basis of a brief description of the soil landscape of the district.

According to the results of soil appraisal that was implemented by the Complex-Exploratory Department in 1990, the highest grade was given to meadow brown medium-loamy soils: 17.4 for nonirrigated farming and the lowest (0.9-1.6) to the brown fine solonetz. Reduction of appraisal grades is related to the reduction of humus content, solonetzicity presence, texture of soil and moistening. Based on the appraisal grades scale for irrigated farming, meadow-brown loamy soils have the highest grade of 40.8 and brown fine solonetz have the lowest grades of 0.8-3.7.

The soil landscape data analysis of different types of agricultural lands shows that pastures dominate in their composition (Table 2.2.4).

**Agricultural use of soils in Indersky district**

Soils	The degree of soil development for farming				% of the area of rural lands
	% of the area of soils				
	Arable land	Deposit	Hayfields	Pastures	
Brown	-	-	-	100,0	10,6
Brown solonetzic	4,7	-	-	95,3	9,3
Meadow-brown	-	-	-	100,0	0,1
Meadow saline desert	0,1	-	-	98,7	0,9
Meadow - flood lands saline desert	1,1	0,3	17,7	80,9	4,2
Meadow-marsh	-	-	-	100,0	0,1
Sands	-	-	-	100,0	35,7
Salt clays showings	-	-	41,8	58,2	7,1
Solonchaks	-	-	-	100,0	1,0
Solonetz	0,8	0,1	-	99,1	31,0
TOTAL:					100,0

Current use of soil has resulted in a noticeable prevalence of pastures in the composition of agricultural lands. Here natural conditions present limitations for farming: the naturally poor quality of the soils, insufficient moisture and excessive salinity.

Soils of the desert zone are characterized by lower humusness, slight thickness of humus horizon, low content of nutrients, minor exchange capacity, high carbonaceousness and salinity (Table 2.2.5).

The reclamation condition analysis of irrigated lands shows the high percentage of saline soils and the presence of solonetz associations. There are 3.0 thousand hectares of saline irrigated arable land including 2.4 thousand hectares of medium degree. There is a solonetz associations presence on the area of 4.9 thousand hectare including 1.4 thousand hectares exceeding 50% (Table 2.2.6).

Saline soils need preliminary ablation with further irrigation of ablation type with a background drainage. Moreover, the solonetz soils require the application of anti-solonetz agrotechnics.

The feature of the soil lanscape of Indersky district is a distinct complexity of intra-zonal soils (floodplain-meadow, meadow saline, solonetz and solonchaks). Soils of the desert zone are mainly distinguished by small humus content, relatively low thickness of humus horizon, low content of ash replenishment elements, minor exchange capacity, high carbonaceousness and salinity. The following factors exacerbate man-made loading and pollution of the district soils: gas pipelines of

Central Asia – Center, oil pipelines Atyrau-Samara; the Atyrau-Uralsk and Atyrau-Inderborsky motorways; enterprises of mining industry “Inderstroyindustiya” LLP, “Indersol” LLP.

Table 2.2.5

**Structural and chemical characteristics of the Inderskiy district soils**

Soil name	Humus horizon thickness, sm	Water-soluble salts depth of occurrence, sm	pH	Base exchange capacity, mg/equiv. for 100 g of soil	Total content, %	
					Humus	Nitrogen
Brown	30-35	60-80	7,5-8,0	13-8	1,3-0,6	0,1-0,03
Brown solonetzic	30-32	60-65	8,1-8,8	12-7	1,2-0,6	0,1-0,03
Meadow-brown	40-70	-	8,2-8,4	19-12	1,9-1,4	0,1
Meadow saline	30-80	28-52	-	-	0,71	-
Meadow - flood lands	45	50-90	7,4	10-7	0,6-0,4	-
Meadow-marsh	30-40	30	-	-	4,0-2,0	-
Sands	-	-	8,0	-	0,3-0,2	-
Solonchaks	10-40	From the surface	8,3-9,4	13-5	1,2-0,3	0,08-0,02
Solonetz	0-10	-«-	8,3-8,6	-	0,5	0,03-0,01

The other factor of air pollution is cattle breeding waste (manure, urine, corpses of dead cattle, etc.). According to the Inderskiy district Veterinary Department the cattle epidemics have not been registered for the past several years. The most widespread of the oblast cattle diseases (by local points) are camel contagious abortion and horned cattle tuberculosis. According to the district’s statistical data, 0.5% of all cattle were tubercular in 1988. Cattle vaccination and dehelminthization fully provide for the reduction of the morbidity rate. The obligatory utilization and burial of dead cattle would facilitate a further reduction of the morbidity rate besides the vaccination and dehelminthization. The establishment of stationary standard points of utilization and burial of dead and sick cattle is necessary. Presently, the district’s farms do not have these units and the burial is carried out at random sides.

The main factors of erosion-deflation processes displays are the following: soils with a light texture presence, high wind pressure, and climate dryness.

Table 2.2.6

**Quality of the Inderskiy district irrigated lands characteristics, hectare**

	Arable land	Perennial plants	Deposit	Hayfields	Pastures
1.The texture of soil:					
- heavy-loamy	3465,0	7,4	23,0	68,0	20,0
- average-loamy	3882,0	12,2	28,0	71,0	17,0
- light-loamy	1328,0	2,9	6,0	60,0	10,0
- sabulous	1467,0	3,5	10,0	30,0	10,0
- sandy	-	-	-	21,0	-
2.By the degree of salinity:					
- total of the second time saline	3062,0	6,3	21,0	124,0	40,0
Including:					
- poorly	603,0	0,5	2,0	16,0	30,0
- average	2459,0	5,8	19,0	78,0	10,0
- strongly	-	-	-	11,0	-
- solonchak	-	-	-	19,0	-
3. Solonetz associations:					
- total	4913,0	12,0	36,0	63,0	-
Including with solonetz content:					
- poorly 10-20%	3475,0	12,0	16,0	32,0	-
- average 20-50%	-	-	16,0	18,0	-
- strongly exceeding 50%	1438,0	-	4,0	13,0	-

According to the quality characteristics of lands implemented by the Complex-Exploratory Department of the “Kaziprozem” Institute, there are 309.3 thousand hectares of wind-eroded soils in the Indersky district. Wind-eroded lands are used as natural forage lands.

Conservation measures are realized through the projects of farm boundary adjustment. Along with this, the development of typical complexes of conservation measures have major significance depending on development of erosion-deflation processes and their degree. The combination of conservation technology and territorial regulation of farming is supplemented where is necessary by forest and hydro land reclamation measures in the aobve mentioned complexes.

According to the results of the irrigated land inventory, out of 10.1 thousand hectares of arable lands there are 3.0 thousand hectares of saline including 2.5 thousand hectares of medium-saline soils under the arable lands and deposits. The

absence of a drainage system has resulted in a change in the water-saline balance of soils and ground waters; therefore all irrigated lands need preventive land-reclamation measures against secondary salinity.

The 78-81% of salt reduction under the differential rate depending on the salinity degree, can be achieved by the ablation against the loosened background. The basis for positive results of ablation irrigation regime lies in systematic drainage works. Besides, there are 1438 hectares of arable lands located on natural solonetz associations that consist of more than 50% of solonetz in the district. Their use for agriculture should be combined with complex agro-meliorating measures. In conditions of irrigated farming, ablation against the drainage background should be conducted using higher standards than on the areas of secondary salinity (from 25 thousand m<sup>3</sup>/hectare and higher). More effective profile desalination and enrichment of the soils by organic substance should be achieved by deep land reclamation, the obligatory insertion of gypsum, sowing of solonetz-stable crops and fertilizing. The gypsum insertion dosage and ablation norm for 1 hectare on every area should be determined after the survey.

The presence of industrial and mining enterprises results in the character of destroyed lands that are represented by the activity of farms, road and civil construction, and also by the Inderborsky mine.

## **2.2.6. Flora and fauna**

### **2.2.6.1. State of the flora**

The area is located in the desert zone of the Aral-Caspian province of Naryn flat sands (the western part of the area) and in the coastal low-lying plain (the eastern part of the area). The local vegetation is typically void of any Graminae communities and dominated by xerophyte and halophyte shrubs, represented primarily by *Artemisia* and *Salsola* species. Amongst *Artemisia* *Artemisia terrae albae* is the most common in association with *Artemisia lerchiana* and *monogina*. In the north, *Artemisia* is mixed with *Stripa sareptana*, *Agropyron*, and *Euagropyrum*; in the south – with ephemers such as *Poa bulbosa* and *Bromus tectorum*. Weed and venomous plants are met in great numbers including *Euphorbia*, *Anabasis aphylla*, and also *Salsola* species including *Ceratocarpus arenarius* and *Ehinopsilon*. On solonetz soils, *Artemisia vulgaris* communities are met as patches while on sand *Artemisia arenaria* is widely spread (Figure 2.2.4).

*Artemisia terrae albae* pastures are the most widespread in the area occurring on the plain, sands and the Ural River valley. They are more frequent in the plain on brown clay loam and clay sand soils and less frequent on sand and rare in the floodplain. They are also seen in the Indersk Mountains on brown undeveloped clay

loam soils. *Artemisia terrae albae* pastures are primarily represented by *Artemisia terrae albae*, *Artemisia terrae albae*-ephemers and *Artemisia terrae albae*-*Salsola* species. In the mountains, *Artemisia* occurs together with *Agropyron desertorum*, *Elytrigia repens*, *Stipa sareptana*, *Eremopyrum orientale*, *Poa bulbosa*, and also *Salsola* such as *Ceratocarpus areanarius*, *Climacoptera brachiata*, and ubiquitous *Anabasis aphylla*.

*Artemisia terrae albae* pastures are common in all elements of the sand terrain. Their composition is richer than on the plain. Ephemers such as *Poa bulbosa*, and *Bromus tectorum* are associated communities with *Artemisia terrae albae* pastures. *Helichrysum arenarium*, *Syrinia siliculosa* and *Chondrilla juncea* are common. *Ceratocarpus arenarius*, *Artemisia arenaria*, *Euagropyrum* and *Anabasis aphylla* and *Paganum harmala* are also often seen. In the floodplain of the Ural, besides ephemeral *Artemisia* is accompanied by *Algahi pseudalhagi*, *Carex uralensis*, *Polygonum*.

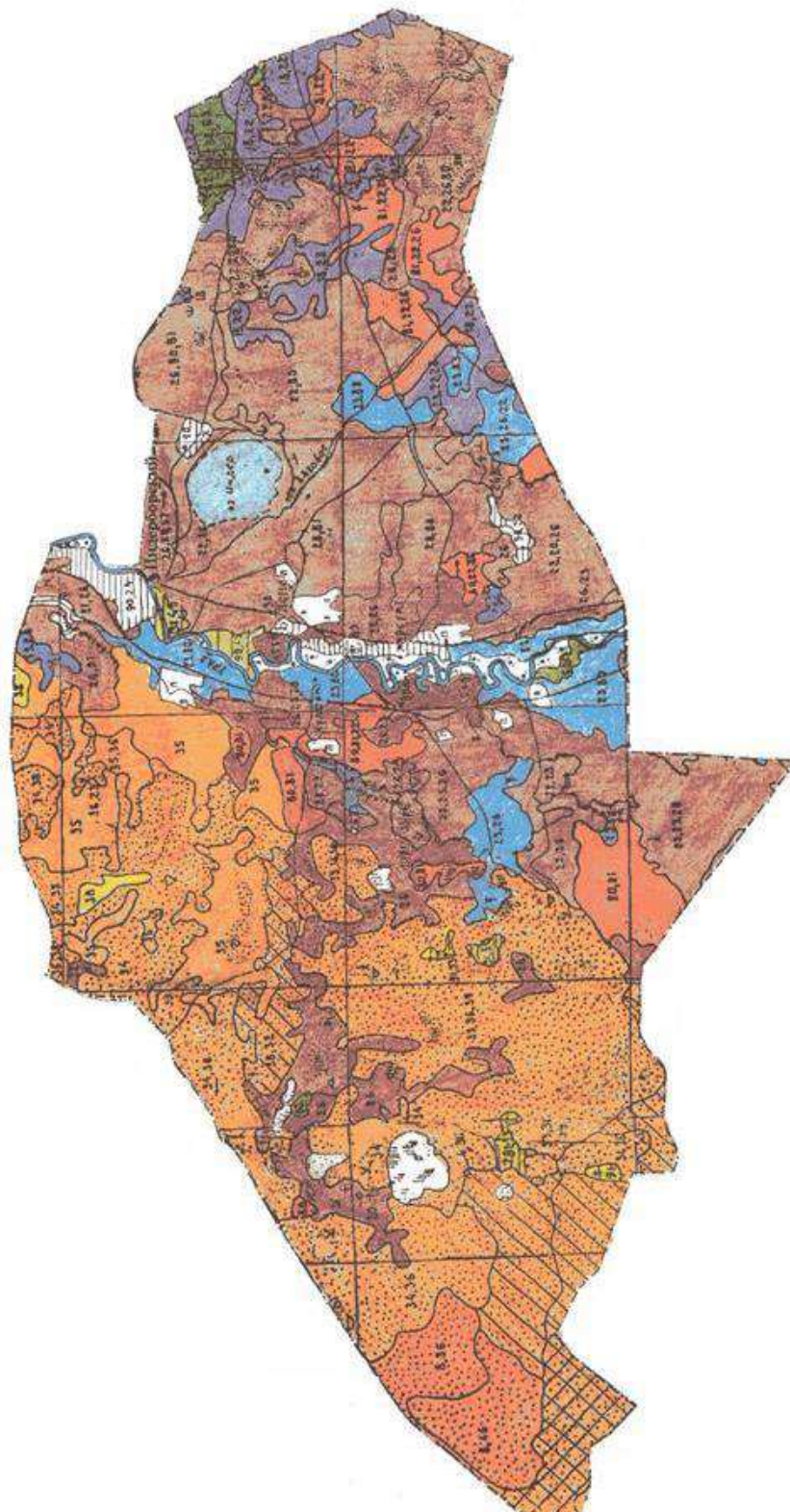
*Artemisia terrae albae* pastures are recommended for use during the spring-summer-autumn period for grazing of sheeps, horses and camels, while pastures with occurrence of ephemeral species should better used during the spring-autumn period.

After *Artemisia terrae albae*, *Artemisa* pastures with *Artemisia terrae albae* and *Artemisia lerchiana* are the most widespread in the area. They normally occur in pre-sand plains on brown soils of various textures as well as on sands and in the Ural valley on meadow-brown and meadow soils. These pastures are located mainly in the western part of the area. Beam pastures are represented by *Artemisia*, *Artemisia*-ephemeral, *Artemisia*-*Graminae*, *Artemisia*-*Salsola* species. In the plain, *Poa bulbosa*, *Bromus tectorum*, *Euagropyrum*, *Elymus arenarius*, *Ceratocarpus arenarius*, and *Climacoptera brachiata* are sub-dominants. On sands, the dominant species are the following *Artemisia terrae albae*, *A. lerchiana* and *A. arenaria*. The typical accompanying plants are *Helichrysum arenarium*, *Syrinia siliculosa* and *Salsola pualsenii*, and *Euphorbia* spp.

The spring is the time for abundant growth of ephemers such as *Poa bulbosa*, *Bromus tectorum* and *Alyssum desertorum*. *Artemisa* pastures are recommended for use during the spring-summer-autumn period as pastures of sheeps, horses and camels.










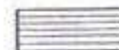

The ephemeral pastures are observed as small patches throughout the area. They are normally formed on brown soils of different textures, sands, and desert solonetz. *Poa bulbosa*, *Bromus tectorum* are the dominant species. Pastures with prevalence of ephemers are recommended for use in the spring for all kinds of livestock.

In the depressions of the plain, *Artemisia vulgaris* occur on desert solonetz soils in combination with *Artemisia terrae albae*, *Salsola* pastures forming uninterrupted communities in the western part of the district.

















**Figure 2.2.4 Map of ecosystem groups of Inder region  
Scale 1:800000**

## Ecosystem groups

- 
psammophytic shrub vegetation (8) mostly *жугунокыяйт* (8), on the automorphous sandy soils of non washed type.
- 
Halophytic suffrutescent (*солончоколончокыяйт*) and suffrutescent (14, 15, 18, 19) mostly *сарсарат* (15) on the hydrogenic and the half bog soils of washed type. Seaside salt soil, alkali soil, saline brown.
- 
halophytic and erohalophytic suffrutescent (20-30) mostly *бюөргүмкыяйт* (22) and white land sagebrush (26) on the automorphous soils of the regularly washed and non-washed types. Salt soil, sodic soil, brown sodic and salty soils ( including sandy loam and sandy silt soils)
- 
hemi psammophytic suffrutescent (31-37) mostly white sagebrush *лерхонолончокыяйт* 32 and *шакпыроккыяйт* (36) on the sandy and sandy loam soils of the non-washed and regularly washed types (light nut-brown and brown)
- 
psammophytic and hemipsammophytic perennial grasses, large grasses and crops mostly *епкөк* (38), and *кыяка* (39), gross forbs (45-48), ephemerooids(43) on the automorphous soils of the regularly washed and non-washed types. Sometimes on the clay sandy soils with shallow groundwaters.
- 
xerophitic crops (60, 61) on the automorphous and *полугартокторфкыяйт* soils of seldom washed types, light nut-brown and meadow light nut-brown.
- 
hydrophitic permanent crops mostly reed vegetations (62) on the meadow and meadow marsh land of the half bog and hydrogenic soils usually sandy and silty.
- 
halophytic annual grasses (80, 81) on the hydrogenic and automorphous soils (alkali and salt soils regularly washed and non-washed types.
- 
*Гемипалонсамофиткыяйт* annual grasses, mostly *эфемероидкыяйт*(87) and *эбелеккыяйт* (90), weed grasses on the salty and saline soils, with sandy-loam soils on the surface, regularly washed and non-washed types.
- 
psammophytic and hemipsammophytic annual grasses and *сухосолончоккыяйт* (91, 98) mostly on
- 
the sandy and sandy-loam soils of the non-washed types.

the color matches with ecosystem's class. Numbers in the contour lines means the prevailing groups. Symbols show the ecosystems

- |  |   |  |
|--|---|--|
|  <p style="font-size: small;">center of a region - Inderborskiy</p> |  <p style="font-size: small;">other settlements - Budene</p> |  <p style="font-size: small;">oblast' boundary</p>                  |
|  <p style="font-size: small;">region boundary</p>                   |  <p style="font-size: small;">contour boundary</p>           |  <p style="font-size: small;">railway</p>                           |
|  <p style="font-size: small;">main railless lines</p>               |  <p style="font-size: small;">lakes</p>                      |  <p style="font-size: small;">rivers, intermittent rivers, arms</p> |
| additional symbols   |   |  |
|  <p style="font-size: small;">sor and salt soils</p>                |  <p style="font-size: small;">sands</p>                      |  <p style="font-size: small;">plowing land</p>                      |
|  <p style="font-size: small;">hay-meadow</p>                        |  <p style="font-size: small;">bushes</p>                     |  |

*Artemisia vulgaris* are typical for the northern deserts. Its pastures include *Artemisia vulgaris*, *Artemisia vulgaris*-*Anabasis salsa*, *Artemisia vulgaris*-*Climacoptera brachiata*, and *Artemisia vulgaris*-*Salsola* communities. *Artemisia vulgaris* pastures are recommended for use during the autumn as pasture for sheep, horses and camels.

*Artiplex alba* pastures occupy a significant area in the region. They are ubiquitous throughout the territory, usually covering the ravines of the plain and floodplain terrace and occurring on solonetz and solonchak soils. Depending on accompanying plants, their types include *Artiplex alba*, *Artiplex alba*-*Artemisia terrae albae* and the most widespread *Artiplex alba*- *Artemisia vulgaris*.

*Anabasis salsa* and *Climacoptera brachiata* pastures are also common. They are formed on desert solonetz soils deserted, less often on brown soils. *Anabasis salsa* is often met as pure thickets. *Anabasis salsa*–ephemeros (*Poa bulbosa*, *Bromus tectorum*), *Anabasis salsa* –*Artemisa* (*Artemisia vulgaris* and *Artemisia terrae albae*) and *Anabasis salsa*-*Salsola* (*Salsola foliosa*, *Ceratocarpus*, *Kochia* and *Climacoptera brachiata*) communities occupy small areas. *Climacoptera brachiata* pastures are represented by *Climacoptera brachiata*, *Climacoptera brachiata* - *Anabasis salsa* and *Climacoptera brachiata*- *Artemisia terrae albae* types of pastures. *Anabasis salsa*, *Climacoptera brachiata* and *Artiplex alba* pastures are recommended for use during the autumn period as pastures for sheep, horses and camels, in combination with - *Artemisia terrae albae* - during the spring-summer-autumn period, and in combination with ephemers - during the spring-autumn period for grazing of all livestock.

*Salsola* pastures with prevalence of *Suaeda physophora*, *Climacoptera brachiata*, *Anabasis salsa*, *Ceratocarpus arenarius* get formed everywhere on the plain on desert solonetz soils. *Salsola* pastures are recommended for use in the autumn as pastures for sheeps, horses and camels.

*Halocnemum strobilaceum* pastures occur as small patches throughout the area on solonchak depressions both in the plain and on sands. These pastures are best for use in the autumn for camel grazing.

On the right bank of the Ural River, the Naryn sand land is located. The vegetative cover of sands is rather rich and diverse. *Artemisia arenaria* constitutes the basis of pasturable vegetation. *Artemisia arenaria* pastures are distributed in the western part of the area throughout all elements of hilly sands. Depending on accompanying plants species, the following types are observed: *Artemisia arenaria*, which is the most widespread, *Artemisia arenaria*- *Euagropyrum*, *Artemisia arenaria* -ephemeros, *Artemisia arenaria*-*Leymus ramosus*. *Artemisia arenaria* is recommended for use during the spring-summer-autumn period for sheep and camels, the communities in combination with Graminae are the best for horses. In the western part of the area, *Leymus ramosus* and *Aristida* pastures are formed on hillocky sands especially in hollows of wind erosion.

In the herbage, the following species are usually included *Helichrysum arenarium*, *Syrinia siliculosa*, *Ceratocarpus arenarius*, *Kochia*, *Salsola pualsenii*, *Bromus tectorum* and *Poa bulbosa*. *Calligonum* pastures are observed on sands around in the state farm "Pravda". They are formed on the tops and slopes of sandy hillocks. *Leymus ramosus*, *Aristida* and *Calligonum* pastures are recommended for use during the spring-summer-autumn period for sheep, horse and camel grazing.

In the valleys of rivers, streams, the natural hayfields grow in lowlands. In the eastern part, reed hayfields are observed in the Aktobe gorge on meadow-marsh soils. Graminae species occur on alluvial-meadow soils. Amongst them, meadow soft-cauline cereals such as *Agropyron* spp. are dominating. Besides, *Poa bulbosa*, *Limonium gmelini*, *Phlomis*, *Inula britannica*, *Medicago falcata*, *Artemisia austriaca* are present in the herbage. The area of hayfields is 6.9 thousand hectare, with the productivity being 6.8 centner/hectare of a fodder unit.

The vegetation of Inderkiy district develops in very severe environment remarkable for aridity of the climate, wide amplitudes of temperature fluctuations, heavy lack of moisture and wide occurrence of saline soils. These factors determine the formation of vegetative cover characteristic for the deserts of the northern hemisphere.

The basic vegetation of desert-steppe subzone of light-chestnut soils is tussockous Graminae species (*Festuca sulcata*, *Stipa lessingiana*, *Stipa capillata*, and *Stipa sarepian*), combined with *Artemisia* and *Salsola*. The projective cover of the soil surface does not exceed 40-60 %.

*Festuca sulcata*-*Artemisia terrae albae*, *Artemisia terrae albae*-*Stipa*-*Festuca sulcata* communities are distributed on light-brown clay loam soils. *Euagropyrum*-*Artemisia terrae albae* and *Euagropyrum*-*Artemisia arenaria* pastures are met on soils of light texture. As a result of over-exploitation of pastures, they are littered with *Euphorbia* and annual *Salsola* spp.

In lowlands on meadow-light-chestnut soils, *Agropyron*, *Glycyrrhiza*, *Calamagrotis*, *Aeluropus*, *Limonium*, and occasionally *Tamarix* spp. occur

The vegetative cover of the brown subzone is represented by various associations of *Artemisia terrae albae*, *Euagropyrum*, and *Anabasis salsa*. The widespread pastures include *Artemisia terrae albae*-*Stipa*, *Artemisia terrae albae*-*Euagropyrum*, *Euagropyrum*-ephemeros, *Euagropyrum* -*Artemisia*. Due to anthropogenic impact, the herbage of these pastures degrade, valuable forage Graminae species disappear while annual *Salsola* such as *Ceratocarpus*, *Climacoptera*, *Anabasis aphylla* emerge. *Salsola* and *Halocnemum* communities are widely distributed in saline habitats. On solonetz among brown soils, the vegetation is rarefied and consists of *Artemisia vulgaris*, *Anabasis salsa*, *Camphorosma*.

The vegetation of sands is composed of the communities of xeromorphic-psammophyle plants. Here *Euagropyrum*-*Artemisia*, *Artemisia arenaria*-*Euagropyrum*, *Kochia*-*Artemisia*, *Artemisia* -*Euphorbia* communities are widespread.

In wind-eroded hollows, *Leymus ramosus* with *Calamagrotis* and *Melilotus* form continuous thickets. Amongst shrubs, *Calligonum*, *Tamarix* and *Astragalus* spp are common.

Caused by human activities impact on the environment, the vegetation cover is very rarefied. *Ceratocarpus* spp. having invaded the overgrazed *Artemisia* and *Euagropyrum-Artemisia* pastures is now a landscape plant. Often sandy pastures are littered with *Peganum harmala*, *Anabasis aphylla*. Around water wells, the herbage is completely degraded.

The subzone of southern desert grey-brown soils, including the Usturt plateau, differs by a more monotonous, compositionally poor and rarefied vegetation. It is dominated by *Salsola* cenosis, formed by combinations of *Anabasis salsa*, *Salsola arbuscula* and *Artemisia* groups. Ephemers, ephemeroïds are poorly developed. The projective cover of soils is 20-30 %.

The vegetation of river valleys is rich and diverse. *Agropyron*, *Agropyron-Herbaceous*, *Glycyrrhiza -Phragmyte*, *Agropyron-Glycyrrhiza* meadows are widespread in the floodplains. Due to overuse of pastures, the vegetative cover of river valleys is widely dominated by *Centaurea picris*, *Glycyrrhiza glabra*, *Dodartia orientalis*, *Poterium*.

Based on the results of the analysis of existing geobotanical materials, it should be noted that depending on the level of pressure, different types of herbages have subject to various degrees of floristic composition change, and productivity, i.e. the stages of failure. The specific regime of use and cost-effective methods of the vegetation restoration should be all tailor-made depending on local conditions.

If the general objective is preservation and restoration of the natural fertility of forage producing fields under the conditions of increasing anthropogenic pressure, one of specific issue is conserve valuable lands and hayfields which are the basis for the genetic fund of many valuable species of wild-growing fodder grasses, medicinal, rare and disappearing plants.

It is difficult and not straightforward to determine a category of the valuable lands used in the agriculture. On one hand, these could be good-quality agricultural lands, for instance hayfields which areas are rapidly reducing, thus requiring special utilisation and management regime combining protection with rational use. On the other hand, these are lands with the vegetative cover that have important resource containing or landscape-protective functions.

The vegetation of the area is represented by a number of wild-growing useful species:

Medicinal - *Glycyrrhiza glabra*, *Hyoscyamus niger*, *Helichrysum arenarium*;

Tannic - a willow (*Salix*)

Technical - *Phragmites communis*;

Fibrous - *Achnatherum splendens*.

*Chlamydomus* and *Tulipa shrenkii* are listed in the Red Book.

### 2.2.6.2. State of the fauna

Based on the zoo-geographic zoning, the Inderskiy district belongs to the northern Aral-Caspian deserts of Turan county of Iranian-Turanian province of the Mediterranean subregion.

The territory of the area, the banks of the Ural river has the most diverse and rich wildlife in the country. The vertebrates include 350 species of which 33 are registered in the Red Book as rare and threatened. The most significant populations are of commercially valuable fish stock particularly sturgeon, sea mammal (the Caspian seal), saiga, and fur animals. The shallow waters of the Caspian sea attract high concentration of migrating and moulting birds both shoreland and water.

There are 2 species of amphibious, 12 species of reptile, 225 species of birds and 46 species of mammal registered in the district. About 20 species of rare birds listed the Red Book are nesting in this district. The territory of Inderskiy district demands special attitude to conserve local animal and floristic diversity that requires a sound environmental management and use based on the nature protection legislation.

Amphibians and reptiles. The amphibian and reptile fauna of Volga and Ural basins has been well studied. There are 12 species of reptile and 2 species of amphibians. However, it is now exactly known what the population of these species is. Their density in the region is extremely low with the exclusion of lake frog and common water snake in the floodplain of the Ural river

Based on their occurrence in the terrestrial cenosis, steppe agama and stepperunner are the most numerous followed by sunwatcher, a common species with the endemic occurrence. However the density of their population is comparatively small varying between 0.4 and 2 specimen on a kilometre. Snakes are the most numerous in the floodplain of the Ural and nearby irrigation channels reaching the density 5-6 specimen/km for common water snake and Pallas' coluber. In the desert cenosis, snakes are less frequent than lizards.

In the terrestrial cenosis, the distribution of reptiles is not uniform. The most diverse composition is in the Ural valley with the next centre being at the border of two landscape zones: fixed sands and solonchak-Halocnemum strobilaceum plain. The main factors that affect the poor composition of reptiles are natural including salinity of soils in the coastal areas, large areas of solonchaks void of vegetation and extremely continental climate. The flat relief and degraded vegetative cover aggravate the harshness of the climate, particularly during winter hibernation in snowless winters.

The impact of natural negative factors, limiting both the reptile and amphibian fauna's composition and quantity, is exacerbated by human influence.

Birds. The total number of birds in the North Caspian Sea registered in different seasons varies from 120 to 225 species belonging to 18 genera. In spring, during migration when birds usually fly in a more congregated way, larks account for 15-30%, finch - 14-40%, starling - 7,5-13%, crow - 7,7-9%, sparrow - 10%, wagtails - 2-

6%, swallows - 1,5-3,5%, sea gulls - 2-4%, snipes - 2%, dove - 1%, raptorial - 0,4-0,7%, kingfishers and relatives - 0,2-1,6%, goose - 4-6%.

The same species are noted in the autumn migration. Migration of terrestrial birds occurs more broadly while waterbirds fly more narrowly. All species of terrestrial genera are extremely small in number during nesting and met in a significant quantity in areas adjoining to the seaside of deserts during seasonal migration. They do not congregate in large numbers.

The ecological group of water birds species is multiple and includes 102 species (41,6%) (Anseriformes, Charadriiformes, Podicipiformes, Ciconiiformes, Copepoda, Rallidae and Phoenicopteriformes).

Due to the location and favourable conditions, the floodplain of the Ural river is home for the large amount of waterbirds, which stop there for long periods. Shallow waters of the North and Northeastern coast of Caspian Sea are particularly important during autumn flying over and moulting periods. The duration of spring migrations varies greatly. However, in average, the migration begins at the end of February - the beginning of March. The migration ends at the beginning of May. The annual migration of single birds and couples that finished breeding (ducks and snipes) for moulting begins in July. At the end of August, the autumn migration starts lasting till the end of November.

Therefore, the North Caspian and the Ural River valley are the most important flyway (NB For the corrector: flyway is the standard term used by ornithologists) in Eurasia for birds migrating from Siberia to the Caspian and hereinafter to Asian and African wintering grounds. Based on the analysis of ornithological situation in the Northern Caspian coast, it follows that, first, shallow water is not a place of mass nesting of coastal and waterbirds, but serves as a stop-over ground for birds of this ecological group during seasonal migrations; second, the distribution of birds by habitats is uneven and open sea shallow waters are the most attractive grounds for birds.

Starting from the end of November, due to migration of birds to the south, their number decreases and comprise from several tens to thousands birds depending on the ice state. These are mainly swans, crow and white-tailed sea eagle that keep open water areas in frozen shallow waters.

Mammals. The mammals diversity is rich containing 46 species, of which 4 species are considered numerous (fox, steppe polecat, saiga and Eversmann's hamster), 23 species are common, and 2 species are rare and disappearing, listed in the Red Book of RK (Bat *Eptesicus bobrinskoi* and marbled polecat).

Based on zoological and geographic classification, the steppe mammals in this region are very infrequent, some steppe polecats and sagebrush voles are rarely met. The base of the fauna consists of desert species, accounting for not less than 27 species including 11 very common. The density of mammals population in the region is comparatively low mainly due to natural conditions.

Amongst commercially valuable species, fox, steppe polecat and saiga are the most numerous. The saiga is a very valuable animal for the economy, though its

number in the region is low and observed only during wintering periods. The fur-bearing commercial animals, dwelling in this region (fox, corsak, steppe polecat, wolf and others) are traded in small numbers.

In the recent years, the overall number and population density of great gerbil and other species of gerbils, the most common in deserts of the Pre-Caspian region, are at a rather low level fluctuating between 0.6–5.8 individuals/ha. Other background species such as European souslik and little souslik are met at the density varying between 0.3 to 3 indiv/ha. Nocturnal Great, Little and Feather-tailed three-toed jerboa have been counted on night routes from 1.2 to 6.5 per 10 km.

The commercially valuable mammals such as saiga, fox and steppe polecat as well as animals-carriers of infectious diseases such as Siberian jerboa, Hairy-footed jerboa, Feather-tailed three-toed jerboa Grey hamster and gerbils are the most prominent species in the region of oilfields.

Species included in the Red Book of Russia and Kazakhstan, are rare and nearly extinct. In Inderskiy district amongst mammals included in the Red Book of Russia, piebald shrew and marbled polecat can be met.

In Kazakhstan, the sand shrew is rare and endemic animal that prefers to shelter in semi-fixed sands and sand bars. They dwell in holes often occupying abandoned holes of rodents. They feed on insects and small lizards. The lifestyle is settled and nocturnal. The marbled polecat is the rare little animal that holds together with gerbils, especially Libyan bird.

Amongst reptiles of the region, it is possible to meet the large whip snake, which occurs on the right bank the Ural.

The game fauna includes species of steppe, semi-desert and desert biocenosis. The following species are sheltered here:

Mammals: saigas, wild boars, wolves, corsaks, red foxes, steppe polecats, European hares, muskrats and sousliks.

Birds: geese, ducks, snipes, teal, coots and doves.

Fish: catfish, pike, pikeperch, carp, bream, ide, tench, perch, crucian carp, roach and others.

Except for the above-mentioned species, others occurring in the region and listed in the Red Books of IUCN, Russia and Kazakhstan include pelicans, swan, glossy ibis, pond heron, white and little heron, and fish hawk.

### **2.2.7. Management, treatment and disposal of industrial and domestic waste**

Due to the variety of mineral resources, the Inderskiy district is potential for development of the chemical industry, salt extraction and manufacture of building materials. Huge deposits of borates, potassium-magnesium salts, table salt, highly concentrated brine of multicomponent composition, carbonate raw material, gypsums, pebble-limestone and other building materials are concentrated in the region. Currently, in adjoining to Indebosky territories many industrial enterprises operate including

“Inderstroyindustria plc”, “InderSolt plc”, “Zhayiktransgas” LLP and district printing-house. These enterprises are a part of chemical and petrochemical, light, food and polygraphic industries.

The leading sector in terms of number of working places is the chemical and petrochemical industry; the second place belongs to the food-processing industry and agriculture.

In spite of the large potential and plans for the development of mining industries, a number of enterprises that were in operation in the past now do not work. “Inderstroyinvest” JSC and “InderSalt” PLC have just recently begun the production. The primary waste of these enterprises is ore.

To date, the due control over both quantity and quality of pollution and management of industrial, and agricultural waste is not in place. Based on overall statistics data, emissions of harmful substances in the atmosphere from all regional stationary sources make 0.68 thousand tons of solid (dust, soot etc.), 0.06 thousand tons of gas. All emissions (0.74 thousand tons) do not under go a prior treatment. The main polluters in the district are “Inder” OPS and “ZhajikTransgas-Inder” LPU.

It is important to introduce the strict control over the level of emissions from stationary sources and provision of treatment facilities for both air and water. Besides, the switch of the boilers from solid to liquefied or gas fuel may help to improve the environmental situation.

### **2.2.8. Monuments of a history and culture**

The history and culture of Inderskiy district covers the centuries-old period. On its territory many outstanding samples of fine arts can be found which represent the originality inherent only in this region with familiar tendencies of ancient and medieval art of the Caspian countries. Overall, there are 67 monuments (Alimgereev, 2000) of a history and culture (Table 2.2.7).

Amongst them, the Utemisova’s mausoleum (1804-1846) and mausoleum of Murat Monken uly (1843-1906) and Malay-Sary mausoleum are remarkable.

The Siranov’s M.monument, obelisk to the heroes of the Great Patriotic War at Eltay, Zeleny, Kulagino and Orlik villages are of historical importance.

Archaeological monuments include a single kurgan of the XVIII century at Orlik village, the kurgan group of the VIII century.

Archaeological monuments include the monument of Karabala-Kantemir and of Sultan-Ali and Khonsha mausoleum.

As established by the regional town-building planning, during the construction of some areas it is necessary to apply certain measures for the protection of monuments. The further design should concretise them before the implementation of the design decisions.

## **2.3. Environmental condition of Kyzylkokskiy district**

### **2.3.1. The brief characteristic**

Kyzylkokskiy district is located in the northeast part of Atyrau oblast and borders in the north with the Western Kazakhstan oblast, in northeast with the Aktyubinsk oblast, in the west with Mahambet and Inderskiy areas, and in the south with Zhylyoi and Makat areas. The region occupies 24,884.23 sq. km or 21.2 % of the total oblast area. The stretch from the north to the south is 200 km, and from the west to the east, it is 170 km.

The administrative centre is Mialy village, located 325 km from the regional centre. The communication with the oblast centre occurs through the railway line Atyrau-Kandyagach and roads of the regional importance Mialy-Sagyz and Makat-Karabau-Raygorodok-Mialy.

The motor roads of the regional and local importance connect the village with central farms. The average distance from the regional centre to these farms is 80 km and varies from 10 up to 140 km.

According to the data of the Regional Statistics Agency, the population in the district is 29.6 thousand people.

The district economy is based on agricultural production. After the decentralisation and privatisation, former state farms were disbanded, and 2 joint-stock companies, 1 production co-operative, 5 public limited companies of agricultural production and 72 country facilities have been organised instead. The industrial production of area is poorly developed including oil-extracting administration “KaynarMunay” and “Matyn” JC which two years ago have started oil development in a small scale.

Overall, the following facilities are located in the Kyzylkokskiy district: the oil pipeline (150 ha), power transmission line of “AtyrauEnergo” (13 ha), railroad lines Atyrau-Kandyagach, Makat-Aleksandrov Gai (2,862 ha), and highways (927 hectare).

Now in Kazakhstan, Atyrau oblast is the affected by the environmental crisis. The Taisoigan military site occupying 750 thousand ha has both environmental and economical importance in the district.

Table 2.2.7

**List of monuments, busts, memorials, obelisks in Inderkiy district as of 01.11.2000 year**

	The name and type of monuments	Location	Date of erection	The administrating organisations
1	2	3	4	5
1.	Necropolis Shelek mola, kulpytas № 11 (architectural)	Inde-Karabau «N» 20 km	1892	Village administration of Zhaksuat
2.	Necropolis Shelek mola, the mausoleum (architectural)	-«-	XIX century.	-«-
3.	Necropolis Shelek mola, the mausoleum (historical)	-«-	-«-	-«-
4.	Necropolis Shelek mola, saganatam (historical),	-«-	-«-	-«-
5.	Necropolis Shelek mola, kulpytas 18 piece (architectural - monumental)	-«-	-«-	-«-
6.	Necropolis Shelek mola, kulpytas № 5 (architectural - monumental)	-«-	-«-	-«-
7.	Necropolis Shelek mola, kulpytas № 4 (architectural - monumental)	-«-	-«-	-«-
8.	Necropolis Shelek mola, kulpytas № 6 (architectural - monumental)	-«-	851 year	-«-
9.	Necropolis Shelek mola, kulpytas № 7 (architectural - monumental)	-«-	-«-	-«-
10.	Necropolis Akshadyra, the mausoleum (architectural - monumental)	0.5 km southwest, 20 km from Inder Karabau	XIX century	-«-
11.	Necropolis Akshadyra, kulpytas № 2 (architectural - monumental)	8 km south 0.5 km from Inder Karabau	XIX century	-«-

Table 2.2.7 continued

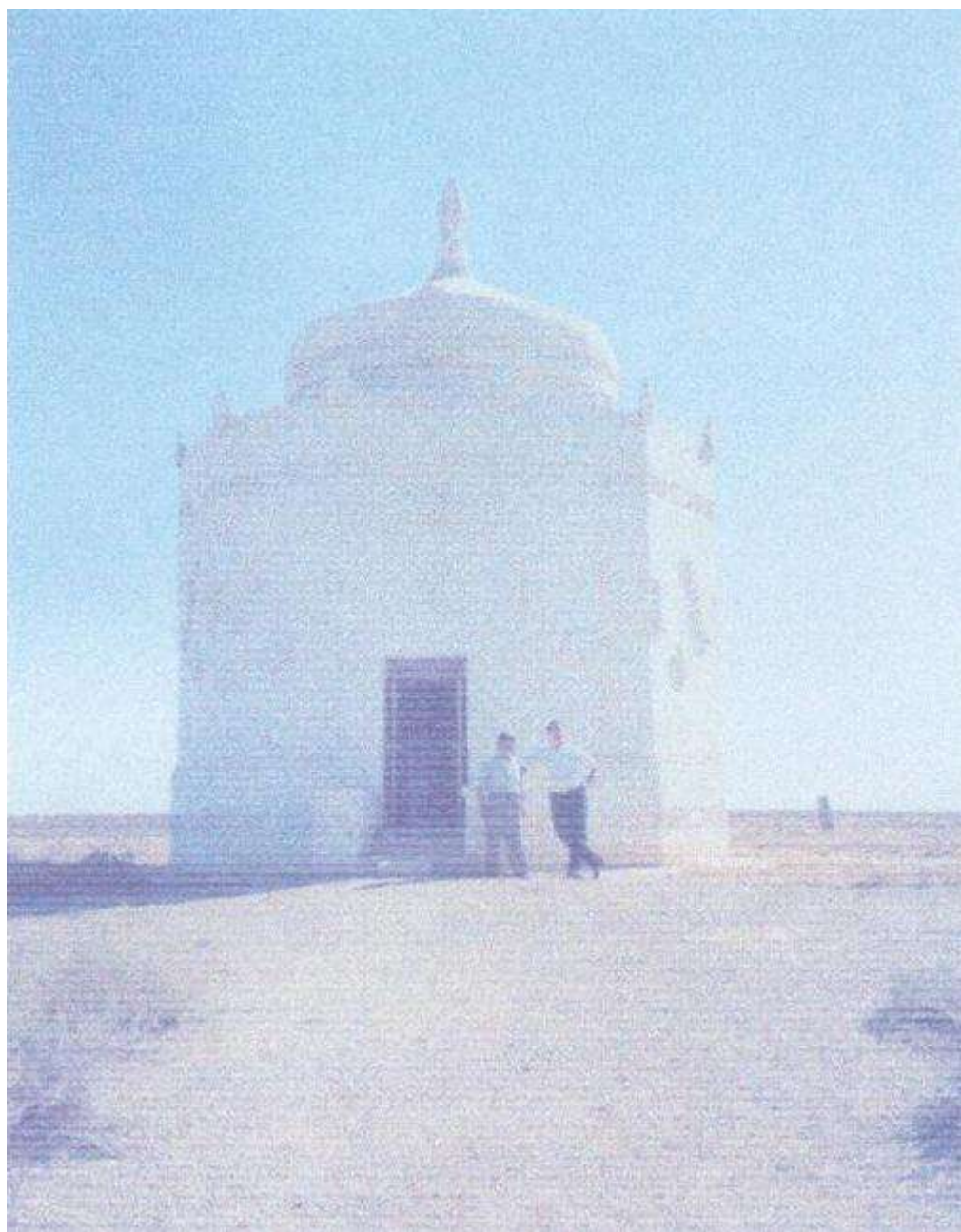
1	2	3	4	5
12.	Necropolis Karabala-Kantemir, the mausoleum (historical)	8 km south of the road Inder-Karabau 25 kms	-«-	-«-
13.	Necropolis Karabala-Kantemir, kulpytas № 2 (architectural)	-«-	1828	-«-
14.	Necropolis Ketebai, kulpytas (architectural)	1.5 km south of the road Inder-Karabau 28 km	1910	-«-
15.	Necropolis Sultanali (architectural)	2.5 km north of the road Inder-Karabau 30 km	XIX century	-«-
16.	Necropolis Sultanali, kulpytas № 3 (architectural)	2.5 km north of the road Inder-Karabau 30 km	1871	-«-
17.	Necropolis Sultanali, kulpytas № 4 (architectural)	2.5 km north of the road Inder-Karabau 30 km	1930	-«-
18.	Necropolis Kenzhemola, saganatam, kulpytas (architectural)	11 km southeast of the road Inder-Karabau	XIX century	-«-
19.	Saganatam № 22 (architectural)	2 km northeast of the road Inder-Karabau 30 km	XIX century	-«-
20.	Necropolis Khansha, the mausoleum (architectural)	45 km northeast of the Zhaksuat village	XIX century	-«-
21.	Necropolis Khansha, kulpytas № 5 (architectural)	-«-	-«-	-«-
22.	Necropolis Khansha, kulpytas № 3 (architectural)	-«-	1891	-«-
23.	Necropolis Khansha, kulpytas № 7 (architectural)	-«-	1875	-«-
24.	Necropolis Khansha, kulpytas № 9 (monumental - architectural)	-«-	1883	-«-
25.	Necropolis Khansha, kulpytas № 10 (architectural)	-«-	1882	-«-

Table 2.2.7 continued

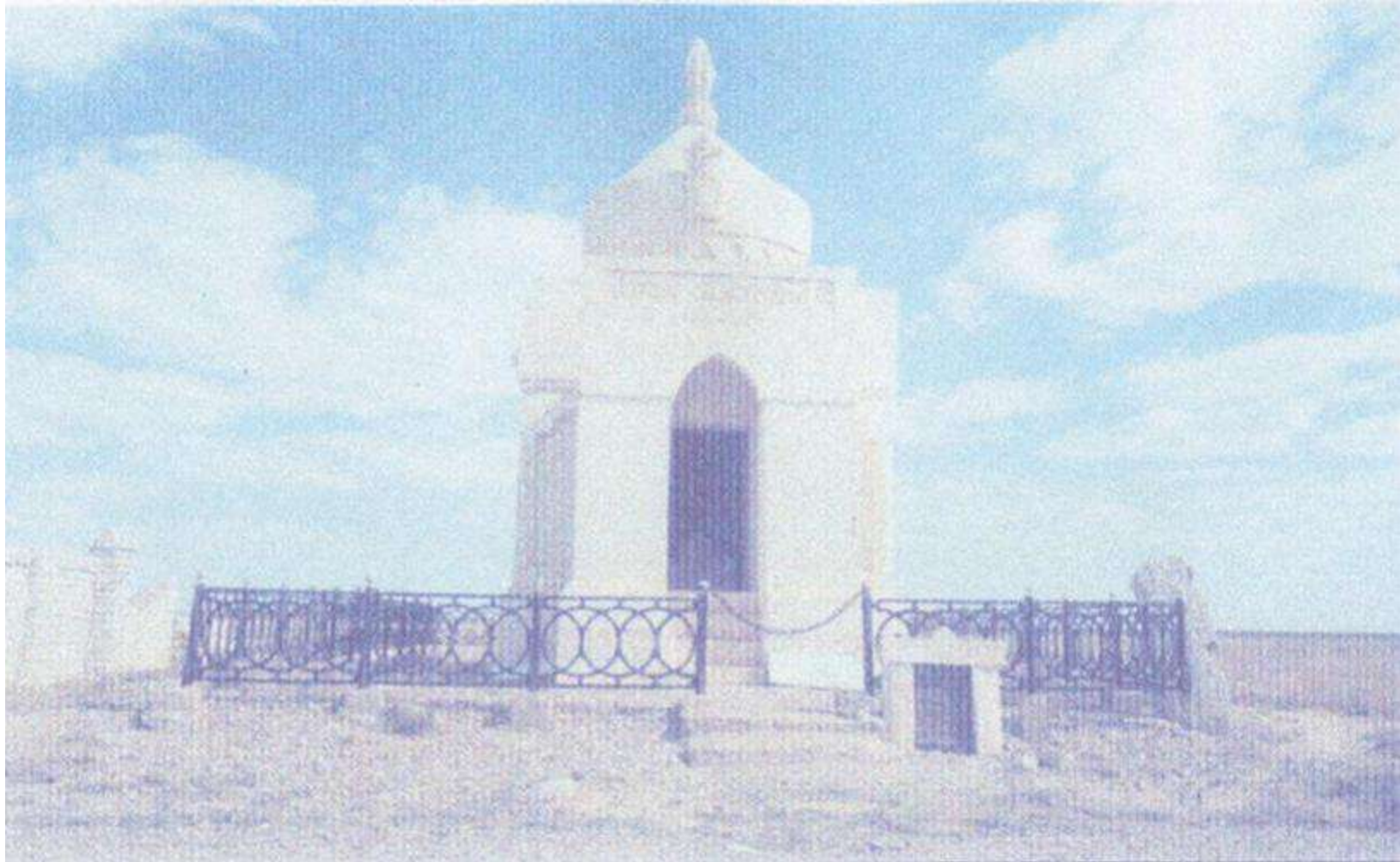
1	2	3	4	5
26.	Necropolis Khansha, kulpytas № 11 (architectural)	-<<-	1920	-<<-
27.	Necropolis Togay, kulpytas № 2 (architectural)	4 km south Inder-Karabau	1874	-<<-
28.	Necropolis Togay, kulpytas № 3 (architectural)	37 km Inder-Karabau	1862	-<<-
29.	Necropolis Togay, kulpytas № 4 (architectural)	-<<-	1888	-<<-
30.	A necropolis of Silly women, the mausoleum № 1 (architectural)	3 km south Inder-Karabau	XIX century	-<<-
31.	A necropolis of Dur, kulpytas № 2 (architectural)	-<<-	1860	-<<-
32.	A necropolis of Dur, kulpytas № 3 (architectural)	-<<-	1817	-<<-
33.	A necropolis of Dur, kulpytas № 4 (architectural)	-<<-	1834	-<<-
34.	A necropolis of Dur, kulpytas № 5 (architectural)	-<<-	1878	-<<-
35.	Mausoleum Terebai (architectural)	3 km south 48 km Inder-Karabau	1874	-<<-
36.	Korym Makhambet (historical-architectural)	50 km south	1959	Regional Culture department
37.	Necropolis Sagatai kulpytas № 1 (architectural),	1 km east of 15 km Inder-Atyrau	XIX century	Village administration of Zhaksuat
38.	Necropolis Sagatai, kulpytas (architectural)	-<<-	1886	-<<-

Table 2.2.7 continued

1	2	3	4	5
39.	Necropolis Sagatai, kulpytas № 1 (architectural)	-«-	1886	-«-
40.	Necropolis Togay, kulpytas № 9 (architectural)	4 km a southeast of 37 km Atyrau-Inder	XIX	-«-
41.	Necropolis Togay, saganatam (architectural)	4 km a southeast of 37 km Atyrau-Inder	XIX	-«-
42.	M.Monke uly monument (architectural)	2 km Zhaksuat village	1993	Village administration of Bodene
43.	Zh. Zhabaev's Bust (architectural)	2 km Zhaksuat village	1971	Village administration of Bodene
44.	The monument to the fellow countrymen unreturned from the Second World War (architectural)	Zhaksuat village	1975	Village administration of Bodene
45.	Makhambet's Bust (architectural)	Zhaksuat village	1987	Village administration of Zhaksuat



**Figure 2.2.5 Utemisov's M. mausoleum, 40 km to the southeast from the Inder town**



**Figure 2.2.6 Monkeuly's M. mausoleum, 2 km from the Zhaksuat village**



**Figure 2.2.7 Malasyary Mausoleum, 40 km to the southeast from Inder town**

The Taisoigan missile testing site had been in operation from 1952 to 1992. Its initial area was 750 thousand ha. The area for missile fall was 1,255 thousand ha. The site was used by the strategic missile forces (SMF) and military-air forces (MAF) of the Soviet Union, and then of the Russian Federation. Falling areas for missile vehicles stages and armed missile is the same as the area where the rest of fuel falls. As a result of toxic substances spills, soil and vegetation has become degraded. The components of rocket fuel produce more than ten intermediate products. Most of these products are as toxic as the initial substance asymmetrical dimethylhydrazine.

Based on the geomorphological description, the large part of territory is attributed to the Pre-Caspian accumulative Upper-Quaternary marine and occasionally alluvial lowland of marginal trough with the conserved marine level of salinity and partial Aeolian structure. The terrain represents the sea of the general southwestward inclination and mainly composed of sandy and partially clay loamy Upper-Khvalynian deposits while in the east and northeast it contains clays. The monotony of territory is broken by the locked depression of an insignificant depth which are occupied by solonchaks, sors, and takyrs especially in the southwest part, and also by large lands of hilly and ridgy sands. The absolute heights vary within -20 to +100 m.

The rate of territory partitioning by ravine-beam network is 0,04 km /km<sup>2</sup>; the depths of local erosion bases reach 16 m, and the average gradient of water collection is less than 10.

In the southeast part, the Pre-Caspian lowland transforms into the elevated denudated reservoir-stage of the Mezo-Neozoic Pre-Ural plateau representing a heavily intersected bank-elevation area of the step-like form of the relief.

The location of the district inside the Euroasian continent has predetermined the extremely continental climate with its specific features: short low-snow and cold winter and hot long summer.

According to Agro-climatic Resources of Guryev and Mangyshlak Oblasts of the Kazakh SSR (Hydrometeoizdat, Leningrad, 1978), the area is located in two agro-climatic zones: I (the Karabau meteorological station) - arid and moderately hot and Pa (the Topash meteorological station) – very arid and hot.

The agro-climatic zone I occupies the northeastern part of the district and includes the lands of the following former state farms Abay, Tasshagyl, Komsomol, Kyzyl-tu, Dzhanaildina, Guryev, Lenin (60 % of the total area of the farm), Engels (30 %), and also 25 % lands designated for a long-term use.

The agro-climatic zone Pa occupies the southwestern part of the district.

During the vegetation period, very little precipitation (70-115 mm) falls while all year-round its amount does not exceed 200 mm. This confirms very low water provision of the area; therefore, the hydrothermal factor does not exceed 0.2-0.3. At the same time, the potential rate of evaporation considerably exceeds the quantity of precipitation. During the vegetation period, the possible charge of moisture through evaporation makes 1,105-2,285 mm. The air humidity deficiency is equal 7.8-8.0 millibar.

### 2.3.2. State of the air basin

The industrial production of Kyzylkok region is not well developed, the oil and gas extracting department “Kinarmunaigas and “Matin” SP only in the past few years has begun oil extraction in small amounts. The basis of economy of the region is agricultural production.

The majority of the regional objects, as well as automobile, pipeline and transport objects use harmful and poisonous for all living beings basic materials, reagents for their processing, various fuels, and they are a source of polluting emissions.

At present the main sources of antropogenic pollution of the air basin of Kyzylkok region, according to emission limits from stationary sources, are the objects of oil and gas extraction, the oil tank, thermal energetic units and transport (Table 2.3.1). Among them the main source of pollution is “Kinarmunaigas”. The emissions from thermal energetic sources, due to their small capacity, are of the local character.

Table 2.3.2 shows that according to dynamics of gross emissions of pollutants into the atmosphere in Atyrau oblast, the air basin of Kyzykogin region is polluted by industrial enterprises less than that of other regions.

Nevertheless, the air basin of Kyzylkok region suffers from severe local pollution from the Tisoigan testing grounds, which occupy 750 thousand hectares.

The Tisoigan missile testing grounds are situated in Kyzylkok region of Atyrau oblast and it was active from 1952 to 1992. Its total area was 750 thousand hectares. The area of falling missile debris was 1255 thousand hectares. The testing grounds were used by missile troops of strategic purpose (RVSN) and military Air-forces (VVS) of the Soviet Union and later by the Russian Federation.

The Tisoigan testing grounds were divided into 3 parts with different purposes.

Part 1 was the “Makat” grounds of the 4th state central grounds of these troops with the quarters in the town of Kapustin Yar. Falling of the first stages of ballistic missiles SS-20 and of other missile stages occurred on the territory of this part of the grounds, and since 1986 also landed missile stages on mixed hard fuels.

Part 2 of the grounds was occupied by battle fields of the 929th flying-testing centre (GLITS) of the Air-forces with the centre in the town of Aktubinsk (Astrakhan oblast of the Russian Federation). This part was used for testing self-laying missiles of the “air-land” type.

At the beginning of 1995 a pack of documents called “Lease contracts” were prepared with the aim of putting into life “The agreement between the Russian Federation and the Republic of Kazakhstan on the order of use of the 929 state flying testing centre (GLITS) of the Defense Ministry of Russia, objects and battlefields on the territory of Kazakhstan”. According to this agreement, in case of its signing, the Tisoigan grounds with its battle fields of 929 GLITS will be active. Most of the debris, about 700 tons, were collected from this part of the grounds but have not been moved away.

Part 3 of the Tisoigan testing grounds was used for testing winged missiles of the “land to land” type. Until September 1991 this part of the grounds was used by military unit 15660 with the centre in the town of Aktubinsk.

Components of the missile fuel exert a chemical, physical and toxic influence on the environment. The research centre “Applied chemistry” of Russia gives the following characteristics of the components.

The fuel pair of non-symmetric dimetil hidrosine (NDMG) – nitric acid-tetra oxide (AK-27 I) is used in missile-carriers of item 8B65. Non-symmetric dimetilhydrozin is an organic substance, its chemical formulae is  $(\text{CH}_3)_2\text{N}_2\text{H}_2$ . It is a strong rehabilitator. It enters into reactions with most of oxidants. Spontaneous combustion is possible. It dissolves in water with no limits and many other organic dissolvers, such as spirits, 4-chloride hydrogen, chlodon -113, acetone, benzene, kerosene, etc.; with non-organic acids it forms salts which dissolve in water; with nitric acid occurs spontaneous combustion. In normal conditions NDMG is a colorless or slightly yellowish liquid, its solidity is 0,785-0,795 g/cm<sup>2</sup>, with a strong ammonia smell. The boiling temperature is 63 degrees Celsius. The freezing temperature is -55,2 °C. The vapors of NDMG in the air are colorless or slightly yellow-green.

NDMG is a substance of the danger class # 1. While on the skin surface and mucous membranes, it causes chemical burns. With influence on respiratory ducts it causes oedema of the lungs. When in the gastric-intestinal tract, it causes poisoning and affection of the internal organs.

The extreme permissible concentrations of NDMG are:

- in the air of the work zone – 0,1 mg/m<sup>3</sup>;
- in the air of settlements – 0,0001 mg/m<sup>3</sup>;
- in the water of economic-domestic and cultural-service use – 0,02 mg/l;
- in the water of fish economic bodies – 0,0005 mg/l;
- in the plough-layer of the soil – 0,1 mg/l;
- in food products – 0,2 mg-kg per day.

The oxidizer, a non-organic compound, is a mixture of nitric acid with 4-oxide nitrogen; the chemical formulae is  $\text{HNO}_3 + \text{N}_2\text{O}_4$ . It is a strong oxidizer. It enters into reactions with most of rehabilitators; spontaneous combustion is possible. It dissolves in water with formation of nitric and nitrous acids, which in their turn, interact with organic and non-organic substances with formation of nitric and nitric-gas compounds or salts of nitric and nitrous acids.

In normal conditions the oxidizer is of the dark-brown-grayish color, solidity is 1,60 g/cm<sup>3</sup>, with a pungent characteristic smell. The boiling temperature is 47 degrees Celsius. The freezing temperature is -57 °C. The vapors of the oxidizer, nitric oxide, are of the brown-grayish or with low temperature of the red color.

The oxidizer is a substance danger class # 1. While on the skin surface and mucous membranes, it causes chemical burns. With influence on respiratory ducts it causes edema of the lungs. When in the gastric-intestinal tract, it causes poisoning and affection of the internal organs.

Table 2.3.1

**Indicators of the share of pollutants from the stationary sources in Kyzylkagolin region in 1995-1997 and in 1999**

##	List of nature-utilizing enterprises	PDV	VSV								
				Nitric oxides	carbon oxides CO	Sulphur anhidrid SO2	Hydro-carbons benzene	Hard substances (soot, ash, dust)	Hydrogen sulfide	Ammonia	others
1	2	3	4	5	6	7	8	9	10	11	12
						1995					
1.	Miyallinsky ATP	31,48	-	0,59	0,31	-	11,66	8,7	-	-	10,22
2.	Boiler works of the Sagiz railway station	116,69	-	7,21	27,6	79,7	-	2,14	-	-	0,04
3.	State farm Kyzyl-tan	28,9	-	2,12	10,97	4,49	0,34	10,33	-	-	0,65
4.	State farm Tosshgyl	23,47	-	2,17	12,89	1,85	2,35	4,18			0,03
5.	State plant "Gurievsky"	40,18	-	2,29	14,1	6,89	0,46	16,44			-
6.	Kyzylkok multi-branch economic unit, Migaly settlement	-	37,37	6,14	22,07	8,92	0,09	0,15	-	-	-
	Total:	278	20,52	87,94	101,85	14,9	41,94	-	-	10,94	
						1996					
1.	State plant Gurievsky	39,5	-	2,29	14,1	6,89	0,46	dust non-organic – 5,22	-	-	0,32
2.	Kyzylkok multi-branch unit, Mialy settlement	-	37,535	6,142	22,07	8,92	0,089	soot- 11,22, soot – 0,146	-	-	0,302
									-	-	
									-	-	
									-	-	
									-	-	

Table 2.3.1 continued

1	2	3	4	5	6	7	8	9	10	11	12
3.	“Atyrau-Zholdary” SC Kyzylkok PDU	8,0448	-	0,35	0,668	0,87	-	Soot- 0,006, Other dust – 2,22 Dust – 3,827, Aerosol -0,0011 Manganese oxide – 0,00014, Dust – 1,912, Other dust -2,22	-	-	Algegid 0,00124
4.	Mialy settlement	5,2649	-	0,23	0,348	0,44	-	Dust -1,915, Soot – 0,006	-	-	0,0124
5.	The Sagir station	2,785	-	0,12	0,32	0,43	-	8,7 2,14	-	-	-
6.	Mialinsky ATR	31,48	-	0,54	0,31	-	11,66		-	-	10,22
7.	Boiler-works of the Sagiz railway station	116,69	-	7,21	27,6	79,7	-	10,33 4,18	-	-	0,04
8.	State farm Kyzyl-tu	28,9	-	2,12	10,97	4,49	0,34		-	-	0,65
9.	State farm Tasshagyl	23,47	-	2,17	12,89	1,85	2,35		-	-	0,03
			-			1997		dust non-organic – 5,22, soot- 10,63, soot- 0,146	-	-	-
	State plant “Gurievsky”	39,5		2,29	14,1	6,89	0,46		-	-	-
1.	Kyzylkok multi-branch unit, Mialy settlement	-	37,535	6,142	22,07	8,92	0,089		-	-	0,168
2.											
.											

Table 2.3.1 continued

1	2	3	4	5	6	7	8	9	10	11	12
3.	“Atyrau-Zholdary” SC Kyzylkok PDY	8,04	- - - -	0,35	0,668 0,348 0,32	0,87	- - -	Soot-0,006, Other dust- 2,22, dust – 3,827, Aerosol-0,0011, Manganese oxide- 0,00014 Dust-1,912, Other dust-2,22, Dust -1,915, Soot-0,006	- - - -	- - - -	
4.	Miyaly settlement	5,26		0,23		0,44					0,01
5.	The Sagiz station	2,785		0,12		0,43		8,7 2,14			0,006
6.	Mialin ATP	31,48		0,54	0,31	-	11,66	10,33			10,27
7.	Boiler-works of the Sagiz railway station	116,69		7,21	27,6	79,7	-	4,18	0,1		0,04
8.	Cooperative of Dosmukhaambetov	28,9		2,17	12,9	1,85	2,35	26,61		-	0,65
9.	Cooperative Tasshagyl	23,47		-	2,94	-	0,939	-		-	1,57
10.	“Kamkor” SC	36,99			-					-	-
11.	ASC “Sagizmunaionimderi”. RGDU“Koinarmunaigas”.	0,939						2,54		-	-
12.		2951,0		59,76	272,02	0,95	2615,7 1999			-	-
1.	“Mukur” SC (no permission) “Mialy” LLP(no permission) PK “Sagiz”	39,5		2,29	14,1	6,89	0,46	15,85 0,146 1,1		-	
2.		- 2,785	37,535	6,142 0,12	22,07 0,39	8,92 0,02	0,089 1,8				0,44
3.											

Table 2.3.1 continued

1	2	3	4	5	6	7	8	9	10	11	12
4.	AZC “Sagizmunaionimderi’	0,94		-	-	-	-0,94	-	-		-
5.	The Sagiz station	2,785		0,12	0,32	0,43	-	1,921	-		0,006
6.	“Mialyavtokolik” (no permission)	0,9		-	-	-	0,9	-	-		-
7.	“Kamkor” SC (no permission)	36,99		1,58	2,94	1,0	-	-	-		-
8.	Cooperative of Dosmukhambetov (no permission)	28,9		2,12	10,97	4,49	0,34	2,61	-		-
9.	“Auylkurylys” SC (no permission)							10,33			0,65
10.	PK “Tasshagyl” (no permission)										
11.	PK “Kozdikara” (no permission)										
12.	PK “Karakol” (no permission)										-

**Dynamics of gross emissions of pollutants into the atmosphere of  
Atyrau oblast (thousand tons)**

Name of region	Years					
	1997	1998	1999	2000	2001	Sum
1. the town of Atyrau	40,92	40,12	50,3	40,0	47,0	218,34
2. Zhylyois	91,41	89,4	112,8	87,0	94,0	474,61
3. Kurmangasin	4,0	3,5	3,6	3,95	4,5	19,55
4. Makat	7,75	7,61	9,47	7,5	9,583	41,913
5. Inder	4,15	4,13	3,41	3,2	3,6	18,49
6. Isatai	13,2	12,96	1612	12,7	15,6	70,58
7. Makhambet	2,49	2,48	2,6	2,5	3,25	13,32
8. Kyzylkagolin	2,0	1,98	3,2	3,2	3,65	14,03
Total in oblast	165,92	162,18	201,5	160,05	181,183	870,83

The extreme permissible concentrations are:

- in the air of the work zone – 2,0 mg/m<sup>3</sup>;
- in the air of settlements – average day is 0,004 mg/m<sup>3</sup>, maximal one time - 0,0085 mg/m<sup>3</sup>;
- in the water of economic-domestic and cultural-service use:
  - according to ion NO<sub>3</sub> – 45,0 mg/l;
  - according to ion NO<sub>2</sub> – 3,3 mg/l;
- in the water of fish economic bodies:
  - according to ion NO<sub>3</sub> – 40,0 (N 9,03 mg/l);
  - according to ion NO<sub>2</sub> – 0,08 (N 0,024 mg/l)

Along with the fuel pair NDMG- FL-27I in a number of missiles, kerosene of various brands are used as fuel.

Kerosene is a mixture of oil hydrocarbons. It is a good organic solvent; it badly dissolves in water, 10 mg in 1 liter.

In normal conditions, kerosene is a colorless liquid with solidity of 0,82-0,86 g/cm<sup>3</sup>, with a characteristic smell. The temperature of the start of distillation is 152 C, the temperature of the end of distillation (90%) is 303 °C. Kerosene vapors in the air are colorless. Kerosene is a substance of danger class #4. When on the skin surface, it causes deprivation of fat, and when on mucous membranes, it may cause irritation. When affects respiratory ducts, it causes suffocation. When in the gastric-intestinal tract, it causes poisoning.

The extreme permissible concentrations are:

- in the air of the work zone – 300 mg/m<sup>3</sup>;
- the approximate safe level of the influence for the air of settlements (OBUV) – 1,2 mg/m<sup>3</sup>;
- in the water of economic-domestic and cultural-service use – 0,3 mg/l.

Besides stages and items on liquid components of fuel, 11 stages, which work on mixed hard fuel has landed, in RP “Makat” since 1986. Ammonia perchlorat is used as an oxidizer in the content of hard missile fuel TPT. In the

process of burning, the oxidizer is restored with formation of hydrogen chloride in the active part of missile flying. Hydrogen chloride, in combination with the atmosphere moisture, forms hydro-chloral acid.

Hard fuel stages of missiles unlike stages on liquid fuel, do not preserve in their trunk non-burnt components and, therefore, at landing in the zone of the fall, do not contain toxic elements, such as ammonia perchlorat and do not emit any toxic products, such as hydrochloride. The main mass of hydrochloride emits into the upper layers of atmosphere and stratosphere.

Ammonia perchlorat is a non-organic salt, a hard substance of the white color, which well dissolves in water. Ammonia perchlorat does not display oxidizing characteristics in water solutions.

Hydrogen chloride in combination with water forms hydro-chloric acid. Ammonia perchlorat is a substance of danger class #1.

The extreme permissible concentrations are:

- in the water of economic-domestic and cultural-service use – 5,0 mg/l
- in soil – 5,0 mg/kg.

The hydro-chloral acid is a substance of danger class #2.

The extreme permissible concentrations are:

- in the air of settlements – average day is 0,2 mg/dm<sup>3</sup>, maximal one time - 0,2 mg/dm<sup>3</sup>;

- in the water of economic-domestic and cultural-service use – 350,0 mg/l;

- in the water of fish economic bodies – 300 mg/l.

Landing of stages and items is impact with the land surface leads to destruction of the stage trunk, depressurization fuel tanks. A crater with a diameter of 4-6 m and a depth of 1,5 m is formed in the place of impact. Scattering of small debris is noted in the radius of 100 meters. As a result, a mechanical damage of the soil vegetative surface occurs.

Partial mixture of the oxidizer and fuel, followed by instant combustion of the latter, usually occurs during distraction of stage tanks with fuel pair YLVU-AK-27B.

Combustion of hydrocarbon fuel, kerosene, takes place at contact with burning hot parts of the stage or during spark formation at impact with the earth.

During the destruction of the trunk of hard fuel, combustion does not occur.

Temperature rise in the process of burning of liquid fuel causes intensive evaporation of components during distraction of tanks is scattered and on vegetation, dump soil, combines with surface and subsoil waters; in the process, the possibility of intensive evaporation and combustion of mixed with water components, decreases.

Thus, the atmosphere, surface subsoil waters, soil and vegetation are affected during distraction of the stage tanks.

Duration of the intensive air pollution will depend on fuel burning of the components, the temperature of the air and soil, speed of the wind, moisture of the soil, presence of water bodies in the place of falling. Intensive pollution of the atmosphere usually lasts from several hours to 1-2 days depending on the above-mentioned conditions. Transference of polluting substances by air masses may

occur on tens of kilometers, at this scattering of components, in the air, decrease of concentration of components while getting away from the source of emission. In the process of transference of fuel components by air masses, some chemical changes in their content will occur. These changes will be caused by interaction of vapors of the oxidizer with the air moisture with formation of nitric and nitrous acids, oxidizing of the fuel by atmospheric oxygen and ozone and its decomposition under the activity of ultraviolet radiation of the sun.

Pollution of the soil, vegetation and water bodies, as a result of atmospheric transference of pollutants can be noted on large distances from the source of emission; however the concentration of fuel components in these objects will be insignificant.

### **2.3.3. State of the flora and fauna**

#### **2.3.3.1. State of the flora**

Kyzylkagolin region is situated in a semi-desert zone of the Near-Caspian province in Uil (the north-western part) and a desert zone of the Aral-Caspian province in Embin elevated-flat (the eastern part) and Near-Caspian lowland-flat districts.

For the vegetation surface a distinct complexity is characteristic, due to the location of the region in 2 natural agricultural zones (Figure 2.3.1).

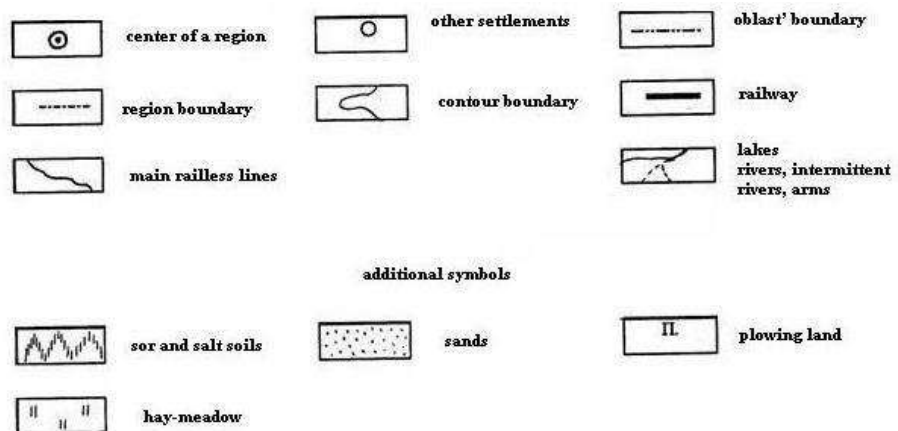
The region has favorable conditions of supply and value of the fodder grounds, as it is the only region in the oblast, which is situated in a semi-desert zone. For this part (former state farms Gurievsky, Kzylty, Komsomolsky, farm named after Dzhangildin, the northern part of the state farms Tasshagylsky, the farm named after Abai, farm named after Lenin), continuous massifs of turf-vine-cereal and turf-vine-cereal-wormwood types of pastures on the valley on light-chestnut supeses and loamy soils are characteristic. The main mass of pasture feed on them is given by Sapertsky feather-grass (tyrsik), desert zhitnyak, wormwood of Lernovsky, tipchak, kovylok. Pastures sometimes weeded by Austrian wormwood. The turf-vine-cereal types of pastures are one of the most valuable among spring-summer-autumn types, used by all kinds of livestock. In some places, with a surface relief, hay mowing is possible.

Turf-vine-cereal pastures are found in combination with desert ones (Lerhovsky and white land wormwood). Wormwood pastures are spread in the valley on light-chestnut sub-sandy and loamy soils. Besides wormwood, an important part of pastures is taken by ebelek, bulb myatlik, as well as cereal, such as feather-grasses, tipchak and zhytnyak. Wormwood pastures are spread everywhere (grey and Lerhovsky wormwood). Subdominants are cereals, such as feather grasses, zhitnyak, ephemerals, bulb myatlik and itsigek. They are found both as massifs and in combination with turf-vine-cereal and solyanka pastures.




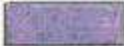







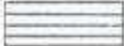



**Figure 2.3.1 Ecosystem groups of Kyzylkok region**

**Scale 1:1200000**



## Ecosystem groups

-  halophytic large bushes (1) mostly tamarisk and селитрянка on the hydromorphous soils of the watering treatment
-  halophytic and галопсаммофитные shrub vegetation (4-6) mostly black боярыш, goat's-wheat on the half bog soils of regularly washed type (saline soil, sodic soil, sandy soil)
- 
-  psammophytic shrub vegetation (8, 9) mostly жутунокольн (8), on the automorphous sandy soils of non-washed type
-  Halophytic suffrutescent (солонхоколосниковый) and suffrutescent (15, 18) mostly сарсазан (15) on the hydrogenic soils of washed type. Seaside saline soil, alkali soil, saline brown
-  halophytic and eohalophytic suffrutescent (20, 22, 23, 24, 26, 28, 29) mostly бисоргунокольн (22) and white land sagebrush (26) on the automorphous soils of the regularly washed and non-washed types. Salt soil, alkali soil, brown alkali and alkaline soils ( including sandy loam and sand silty soils)
-  hemi psammophytic suffrutescent (32, 33, 34, 36, 37) mostly white sagebrush перхоломный 32 and шапырлык (36) on the sandy and sandy loam soils of the non-washed and regularly washed types (light nut-brown and brown)
-  psammophytic and hemipsammophytic perennial grasses, large grasses and crops (38, 43, 46, 47, 48, 51, 54) mostly ерек (38), gross forbs (46), араспана (43) ephemerooids (54) on the automorphous soils of the regularly washed and non-washed types. Sometimes on the clay sandy soils with shallow groundwaters
-  xerophitic crops (56, 57, 59, 60, 61) mostly with wheat grasses (56), тырскольн 57, 59) one automorphous and полугалопфитный soils of seldomly washed types, light nut-brown and meadow light nut-brown
-  hydrophitic permanent crops (62, 63, 67, 69) mostly reed vegetations (62) and ахрекольн (67) on the meadow and meadow marsh land of the half bog and hydrogenic soils usually sandy and saline
-  halophytic annual grasses (73, 74, 75, 81, 86) mostly солонхокольн (80) on the hydrogenic and automorphous soils (alkali and salt soils regularly washed and non-washed types)
-  annual grasses (89, 90), mostly эбелекокольн (90), weed grasses on the salty and saline soils, sandy-loam on the surface, regularly washed and non-washed types
-  psammophytic and hemipsammophytic annual grasses and сухосолонхокольн (91, 94, 96, 98) mostly on the sandy and sandy-loam soils of the non-washed types

the color matches with ecosystem's class. Numbers in the contour lines means the prevailing groups. Symbols show the ecosystems

Erbeek, erbeek-grey wormwood, erkek-cereal and shagyr-cereal pasture, which have a great feeding value, are spread on the territory of the former state farms Kzylty, Komsomolsky, Tasshagyl, the farm of Dzhangildin on the lands of long-term use of Biyrük and Taisoigan sandy massifs.

The turf-vine-cereal, wormwood and erkek types of pastures are recommended to be used in spring-summer-autumn period for grazing of all kinds of livestock.

The biyungun, biyungun-tasbiyungun, biyungun-keireuk and biyungun-black wormwood types of pastures are spread in the south-western part on lands of the non-agricultural use.

The kokpek, black wormwood, solyanka (klimakoptera, ebelek, petrosimonia, izen, kamforosma) types of pastures are spread all over the region in the form of small massifs. These pasture grounds are to be used in the autumn period for grazing of sheep and horses.

The most spread in the region, in the seasonal respect, are spring-summer-autumn pastures. Their area is 1006,3 thousand hectares that is 68,4 % of the total pasture area. Productivity is 1,6 centners/hectare of feeding units. The feeding capacity is 1627,9 thousand centner of feeding units. An area of autumn pastures is 449,1 thousand hectares, 30,6 % of the total pasture grounds. Productivity is 0,9 centner/hectare of feeding units. The feeding capacity is 416,0 thousand centners of feeding units. Spring-autumn and spring pastures occupy small area, 15,7 thousand hectares (1%) and 1,5 thousand hectares respectively. Productivity of the spring-autumn pastures is 1,3 centner/hectare of feeding units, the feeding capacity is 20,4 thousand centners of feeding units. Productivity of the spring pastures is 2,7 centner/hectare of feeding units. The feeding capacity is 4,1 thousand centners of feeding units. The potential feeding capacity of the region totals 2068,4 thousand centners of feeding units.

At present the pasture grounds are used moderately.

170,0 thousand hectares of damages and 107,7 thousand of feed pasture grounds have been found in the region 15,4 % and 9,8 % respectively. 2,9 thousand hectares of cattle damage has been noted.

Damaged and weeded pastures, parts of land have been noted in the intensively used pastures, mainly in turf-vine-cereal pastures. Further gradual development of cattle-breeding of the region is connected with the necessity of preservation and improvement, as well as an increase of the feeding capacity of natural feeding grounds. Radical surface improvement together with pasture calculations are the activities which will be held.

Grass meadow are formed along the river flooding area of the Uil. Among grasses are mainly crawling couch-grass, sometimes surface veinik, common reed; meadow grasses are used as hay grounds. Hay grounds are adjacent to meadow, alluvial-meadow soils. The area of hay grounds is 50,3 thousand hectares.

The feeding capacity is 16,4 thousand centners of feeding units; productivity is 4,3 centners/hectares of feeding units.

According to the data of scientists from St Petersburg University, the fuel list of plants of the region includes 320 species, with the dominating 80.

Analysis of the flora of Kyzylkagolin region shows that the first place, according to the number of species, is taken by multi-flowered (15%), the second place is by marievy (13%), the third is by cereals (12,5%), and then by bean (10,5%). These 4 families of plants comprise 51% types of all the plants of the region.

The live forms are the following:

trees: black and white poplar, aspen, white willow, narrow leaf loch, small life elm;

bushes: Caspian willow, tamarisky, zhuzgun, selitryanka;

semi-bushes: teresken, sea and Austrian wormwood konia, white and black wormwood, wart-like goose-foot, etc.;

grasses: variety species.

More than half of the regional flora are perennial (58%), one-year and two-year plants (29%).

The following species of wild useful plants can be found in the region:

medicinal: bloody-red hawthorn, bitter wormwood;

tanning: kermek of Gmelin, Tatar rhubarb, willow:

technical: leafless anabazis, common reed;

fibrous: kendyr.

There are no species included into the Red Book in the region.

### **2.3.3.2. State of the fauna**

According to a zoological and geographic regional division, Kyzylkok region is included into:

- western part of the semi-desert zone of Kazakhstan district of Kazakhstan-Mongolian province of Central Asian sub-oblast;

- northern Aral-Caspian desert of Turan district of Irani-Turan province of the Mediterranean province.

For the first zone, the following mammals are characteristic: eared hedgehog, hare-rusak, big gopher, common homyak, homyak of Eversman, common polevka (a field mouse).

For the second zone: hare, tushkanchik of Severtsov, big and midday peschankas.

Common for both zones are small and sandy gophers, thick-tailed tushkanchik, tarbaganchik, emuranchik, steppe polecat, korsak, wolf and rarely saigak.

The fauna of surface vertebrates of Kyzylkok region is identical to the fauna of other areas of Atyrau oblast, though with some insignificant differences, due to the physical and geographic conditions of the territory under study. In particular, in the Oitan valley is found quite numerous big peschanka, the western border of its

spread coincides with the valley of the river Ural. Such examples can be found in the group of tushkanchik and other toxsons. Differences in the ornithological fauna are defined mainly by presence of the river Sagiz and respectively by presence of water and near-water birds.

The most numerous in the Oitan valley are saigaks. Calculations conducted in September displayed herds of 200-300 animals each. Some smaller groups were registered, as well as individual animals. Along the Oitan-Shoba motorway it was usually possible to count up to 600-700 animals of this species, with the width of count lane of 2-3 km. Presence of other animals have also been found here, such as fox, korsak, hare-rusak and tolai. Among rare and guarded birds are steppe eagle, kurgannik, eagle-owl; various kinds of ducks are common on the Sagiz river, as well as big vyp and lysuha.

Analysis of the content of species of surface vertebrates comparison the data with the literature ones allows to make a conclusion that the fauna of Tisoigan testing grounds is in a satisfactory state which is proved by the lack of blanks in the species content, high number of dominating species presence of rare and the most vulnerable species, for example, steppe eagle and kurgannik, which are included in the Red Book.

As a result of fauna samples of insects on the territory of the region, it was possible to define the major species, which are active in this season (more complete studies of the insect populations have not been conducted, as for this long-term expeditions in every season are necessary). More that 300 species of insects have been found. Comparison of this list with the literature data of Kazakhstan (Bio-complex studies in Kazakhstan, 1973-1976) allows to conclude that the fauna of insects is typical for these regions.

The following species of Kyzylkagin region, included into the Red Book of the USSR and KazSSR are:

mammals – vyhuhol, perevyazka;

birds – karavaika, beautiful crane, strepet, dzek, krechetka, black belly rybok, zmeed (snake-eater), berkut (during summers) and while migrations), red thyroid kazarka, skopa and sterh.

#### **2.3.4. State of the soil**

According to the territory division, the region is situated in a semi-desert zone on light-chestnut soils and a desert zone on brown-grayish soils (Figure 2.3.2).

Light-chestnut soils are spread in the north-eastern part of the region and occupies 42,4 thousand of hay grounds, 707,8 thousand hectares of pastures and 0,4 thousand hectares of deposits. Among zonal soils the following have been identified:

1. common – 233,6 thousand hectares;
2. salty – 243,4 thousand hectares;

3. stony – 6,5 thousand hectares.

The main components of the soil surface of the sub-zone with light-chestnut soils are various salty lands 1518 thousand hectares, saline lands 14,0 thousand hectares; meadow-light chestnut 34,4 thousand hectares with 23,7 thousand hectares of salty and 7,0 thousand hectares of saline lands; meadow light 34,4 thousand hectares with 23,8 thousand hectares of saline lands; river flooding area-meadow 31,0 thousand hectares, with 26,6 thousand hectares of salty-saline; meadow-marsh – 1,2 thousand hectares.

Division of the sub-zone of light-chestnut soils into melioration groups and their use in agriculture are shown in Table 2.3.3.

In the economic respect, light-chestnut soils are unsuitable for bogar agriculture, due to the arid climate, extreme lack of moisture in soils, poor organic content, vast areas of salty and saline soils, distinct complexity. Soils of this zone are used mainly as natural feeding grounds; an intensive agriculture can be developed only in case of regular irrigation. 11,0 thousand hectares have been ploughed, among them 6,5 thousand hectares are not salty and saline ( common light chestnut), the rest 4,5 thousand hectares (4,2 thousand hectares are salty, 0,2 thousand hectares are deflirated and 0,1 thousand hectares are saline soils) can be used in agriculture in case of melioration, that is washing out on the salty soils with the following irrigation of the washing type with drainage, appliance of organic fertilizers in extra dozes with use of anti-salting technical devices on all saline soils and gypsum-making on extremely saline soils (0,2 thousand hectares).

An increase of agricultural activity in the sub-zone is possible only with an increase of regular irrigation. In the sub-zone of light chestnut soils there are 172,9 thousand hectares of pastures and 5,6 thousand hectares of hay grounds, situated on useful not saline and salty lands, which can serve a reserve of increasing farming lands in case of water supply.

The sub-zone of brown-grayish soils occupies 891,2 thousand hectares of the studied regional territory, among their 15,7 thousand hectares of hay grounds and 978,5 thousand hectares of pastures.

Among the zonal soils of the sub-zone the following types have been identified:

- o common 69,7 thousand hectares;
- o deflirated 10,5 thousand hectares;
- o stony 25,8 thousand hectares;
- o salty 300,1 thousand hectares.

The main components of the soil content of the sub-zone are:

various salty lands – 247,3 thousand hectares, saline – 67,2 thousand hectares, meadow-brown-grayish salty – 5,3 thousand hectares, meadow -5,2 thousand hectares, with 4,9 thousand hectares salty lands, river flooding zone-meadow salty – 5,0 thousand hectares, meadow-marsh -3,8 thousand hectares and sands- 154,1 thousand hectares.

Division of sub-zone of brown-grayish soils into melioration groups is shown in table 2.3.4. Soils of the subsoil of brown-grayish soils are used to the full

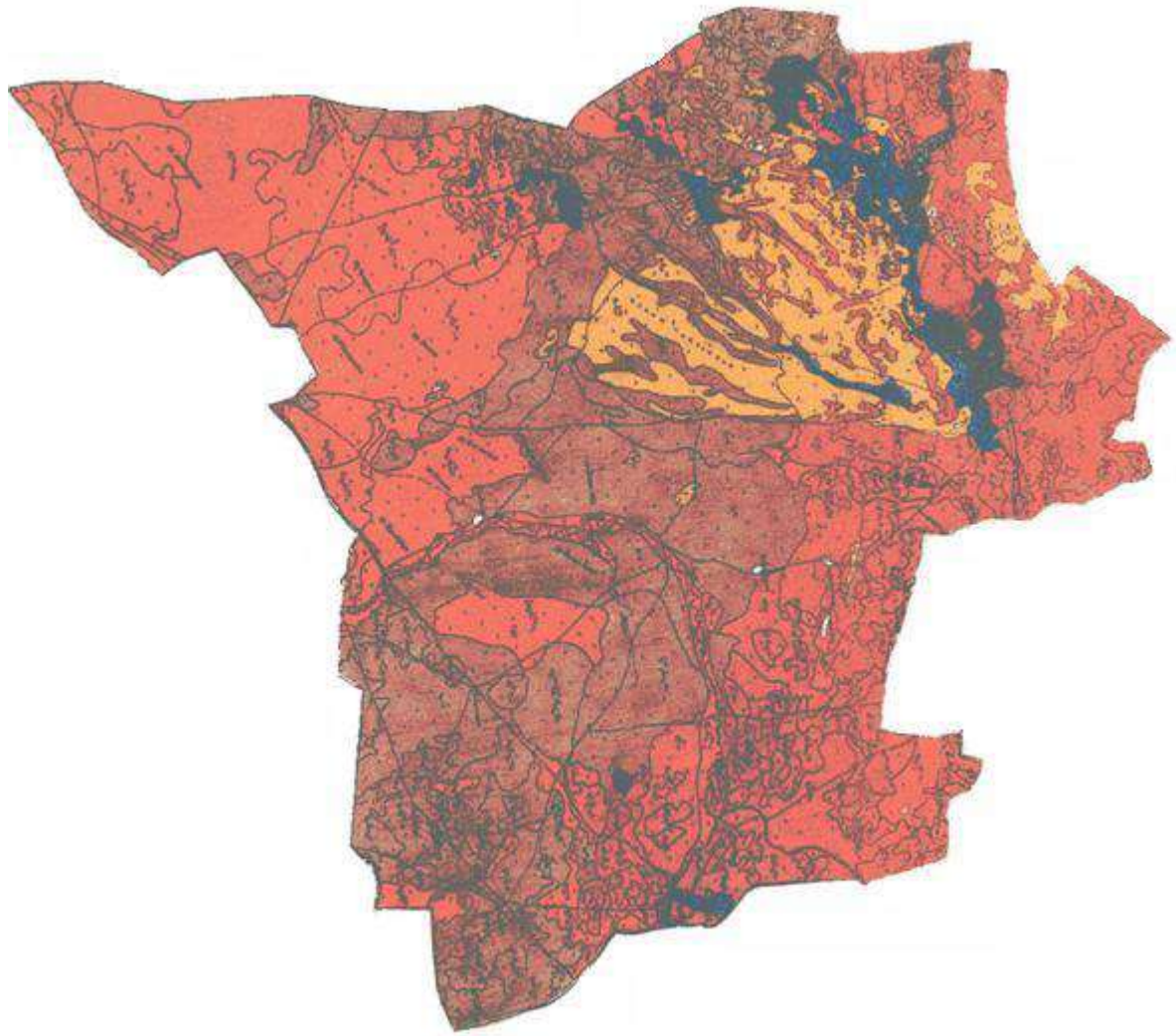
as natural feeding grounds, due to the aridity of the climate, large area of salty and saline lands.

According to the data of quality characteristics of agricultural grounds of the region, it is obvious that salty and saline types of soils prevail in combination with salty and saline lands- 68,3 % (in the sub-zone of light-chestnut soils, these soils total 65,3%, and in the subsoil of brown-grayish – 70,4 %).

Table 2.3.3

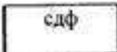
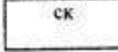
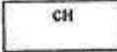

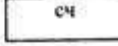
### Division of sub-zone of light-chestnut soils into melioration groups

##	Melioration groups	Total	Including			
			deposit	hay grounds	pastures	
1.	Useful total	178,6	0,1	5,6	172,9	6,4
	undoubtedly useful	5,6	0,1	2,3	3,2	
	Total	28,6			28,6	
2.	Stony weakly	2,7			2,7	
	medium	14,9			14,9	
	heavily	11,0			11,0	
	total	-			-	
3.	Washed out weakly	-			-	
	medium	-			-	
	heavily	-			-	
	total	-			-	
4.	Deflirated weakly	17,5			17,5	0,2
	medium	16,3			16,3	0,2
	heavily	1,0			1,0	
	total	79,7	0,1	22,0	57,6	
			-		25,8	4,0
5.	Salty weakly	30,4		4,6	20,6	
	medium	35,3	0,1	114,6	11,2	
	heavily	14,0	-	2,8	371,1	
	total	377,1	0,2	5,6	137,3	3,3
6.	Saline weakly	139,6	-	2,3	85,9	0,5
	medium	89,4	0,2	3,3	148,1	0,2
	heavily	148,1	-	-	0,1	-
7.	Overmoistured weakly	0,1	-	-	0,6	-
8.	Marsh	1,1	-	0,5	59,2	-
9.	Others	67,0	-	8,7	707,8	10,6
10.	Total	750,6	0,4	42,4		

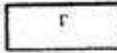

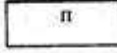
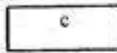
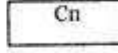




**Figure 2.3.2 Soil map of Kyzylkok region**

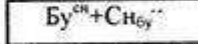
	<b>flood meadow brown</b>
	<b>flood meadow light-chestnut soil</b>
	<b>meadow-swamp light-chestnut</b>
	<b>brown</b>
	<b>meadow-brown</b>
	<b>light-chestnut</b>
	<b>meadow-chestnut</b>
	<b>meadow brown</b>
	<b>meadow light-chestnut</b>
	<b>sand</b>
	<b>salt meadow</b>
	<b>silty alkaline soils</b>
	<b>typical alkaline soils</b>
	<b>alkali brown</b>
	<b>alkali meadow-brown</b>
	<b>alkali light-chestnut</b>
	<b>alkali light-chestnut meadow</b>

	poorly differentiated		saline		nonsaline
	alkaline-saline		alkalized		


**symbols of the mechanical constitution of soils**

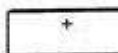
	clay		weakly loam		sand
	medium loam		sandy loam		heavy loam

 30-50%



Soil index according to systematic list of Kazakhstan Republic and mechanical constitution of the upper humus layer of soils


 10-30%



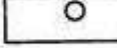
Complexes, combinations, spotting



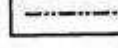
Soil boundaries



center of a region



other settlements



oblast' boundary



region boundary




contour boundary



railway



main railless lines




lakes  
rivers, intermittent  
rivers, arms

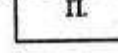
**additional symbols**




sor and salt soils



sands



plowing land



hay-meadow



bushes

### Division of the subsoil of brown-grayish soils into melioration groups

##	Melioration groups	Total	Including		
			deposit	hay grounds	pastures
1.	Useful total	69,7		0,2	69,5
	undoubtedly useful	0,3			
	Total	-		0,2	0,1
2.	Stony weakly	-			-
	medium	3,7			-
	heavily	-			3,7
	total	-			-
3.	Washed out weakly	-			-
	medium	-			-
	heavily	-			-
	total	164,8		6,4	158,4
4.	Deflirated weakly	93,4		1,2	92,2
	medium	69,6		5,2	64,4
	heavily	1,8		-	1,8
	total	136,4		8,2	128,2
5.	Salty weakly	22,4		3,3	19,1
	medium	42,4		4,6	36,8
	heavily	71,6		0,3	71,3
	total	497,9		0,9	497,0
6.	Saline weakly	164,0		-	164,0
	medium	58,5		-	58,5
	heavily	275,4		0,9	274,5
7.	Overmoistured weakly	-		-	-
8.	Marsh	-		-	-
9.	Others	21,7		-	21,7
10.	Total	894,2		15,7	878,5

Among the soils of the territory under study, soils of light mechanical content prevail – 1190,2 thousand hectares (Table 2.3.5).

All the soils of the region have small humus content, a relatively small capacity of the humus horizon, and a low content of elements of ash feeding (Table 2.3.6.)

Table 2.3.5

### Mechanical content of soils, thousand hectares

Agricultural grounds	Total	Including				
		Clay heavily-loamy	Medium loamy	Lightly loamy	Sub sandy	sandy
Deposit	0,4	-	-	0,2	0,2	-
Hay grounds	58,1	8,9	15,2	14,8	8,0	11,2
Pastures	15,86,3	56,3	374,2	660,1	201,0	294,7
Among them improved	10,6	-	0,6	4,0	5,5	0,5
Total	1644,8	65,2	389,4	675,1	209,2	305,9

There are no large industries in Kyzylkok region. Industrial enterprises of the region are “Kinarmunaigas”, “Matin”, and processing units of agricultural products. Emissions from these enterprises contain hydrocarbons, soot (from boiler-works) and sewage water. But they are of the local character, due to their small capacity.

According to the quality characteristics of the agricultural lands, there are 17,5 thousand hectares of deflirated lands and over 215 thousand hectares of degraded lands in the region.

The most negative influence on the land is caused by agricultural activities; chemical and bacterial pollution of the soil, air and water is characteristics, as well as outbreaks of some diseases and spread of pests. For prevention of the anthropogenic influence it is necessary:

- equipment of enterprises (both industrial and agricultural) with complexes of puriating constructions;

- strict follow of the norms of storage and use of mineral fertilizers and chemicals;

- strict follow of field rotation while farming and pasture rotation.

Another vital problem is the local pollution of soils of the Tisoigan grounds. According to the data of RNTS “Applied chemistry”, studies of the soil samples of the testing grounds led to identification in all samples (both taken at launching sites and the adjacent areas) the product rendering of non-structural dimetilhydazine (geptile) – tetrametiltetrazene. It testifies to the fact, that spill of fuel took place on the territory of the testing grounds, as well as in places of falling ballistic, tactical “air-land” and winged missiles, and in adjacent areas, such as in the river flooding zone, near the Temirbai-Oitan road, to the east of Sagiz. In the background samples, that is taken outside the launching sites, tetrametiltetrazene has been found in larger amounts that in the craters themselves. Due to the stability of tetrametiltetrazene it accumulates in the soil and is included in the food chains. Accumulation of tetrametiltetrazene in the environment may have grave circumstances for health of people.

It is necessary to evaluate the accumulation of missile fuel products in the soils of the Tisoigan testing grounds and study migration of these substances in the food chains. Results of the preliminary studies in this direction testify to the fact that missile fuel can play a leading role in the total pollution of the environment, due to activities of the testing grounds.

### **2.3.5. Protection of surface and underground waters**

#### **2.3.5.1. Surface waters**

Resources of surface water in the region are represented by transit flows from the Uil and Sagiz rivers of Aktubinsk oblast. The local flow is formed in the basins of shallow temporary water bodies and is observed in land depressions only in spring. The Uil river does not receive any additional water supply within the region.

Table 2.3.6

**Systematic list of the soils of Kyzylkok region, thousand hectares, their morphological characteristics and the chemical content**

##	Name of soil	Total	Including				Capacity of humus horizon, cm	Depth of location of water-dissolving salts, cm	pH	Capacity of absorption mg/ for 100 g of soil	Total content, %	
			deposit	hay grounds	Pastures						humus	nitrogen
					total	Incl.k.u.						
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	Light-chestnut	240,1	-	3,3	236,8	6,6	30-40	60-80	7,1-8,0	13-6	1,2-0,6	0,1-0,05
2.	Light-chestnut salty	243,4	0,2	2,4	240,8	4,0	30-40	60-80	7,1-8,4	16-6	1,6-0,6	0,1-0,08
3.	Meadow-chestnut	4,0	-	0,9	3,1		40-80	70-90	7,0 -7,5	15-13	2,5-2,0	0,13-0,08
4.	Meadow-chestnut	23,7	-	9,1	14,6		-					
5.	salty		-				-					
	Meadow-chestnut	7,0	-	0,3	6,7		-					
6.	saline		-				-					
7.	Meadow light	10,6	-	2,7	7,9							
8.	Meadow light salty	23,8		10,2	13,6							
	River-flooding area-	4,4'	0,1	1,8	2,5		40-85		7,2-7,5		2,7-2,3	
9.	meadow light											
	River-flooding-	26,6	0,1	11,2	15,3							
	meadow salty											

Table 2.3.6 continued

1	2	3	4	5	6	7	8	9	10	11	12	13
10.	Brown-grayish	106,2		-	106,2		30-35	60-80	7,5-8,0	13-8	1,3-0,6	0,1-0,03
11.	Brown-grayish salty	300,1		1,6	298,5		30-32	60-65	8,1-8,8	12-7	1,2-0,6	0,07-0,02
12.	Meadow-brown grayish salty	5,3		0,2	5,1		32-45		8,2-8,6	18-10	1,2-0,6 1,2-1,1	0,09
13.	Meadow	0,3		0,2	0,1							
14.	Meadow salty	4,9		2,8	2,1							
15.	River-flooding area- meadow salty	5,0		1,5	3,5							
16.	Meadow-marsh	5,0		2,2	2,8							
17.	Sands	154,1		6,4	147,7							
18.	Saline lands	81,2		0,3	80,9		0-10	from the	8,3-8,6		0,5	0,03-0,01
19.	Salty lands	399,1		1,0	396,1		10-40	surface	8,3-9,4	13-5	1,2-0,3	0,08-0,02
19.	Total	1644,8	0,4	58,1	1586,3							

The Sagiz river usually dries out in summer. The Sagiz river is situated between the Ugol and the Emba. The water collecting area within the oblast is 8600 km<sup>3</sup>, its length is 200 km, the area of 500-meter zone is 20 thousand hectares, the area of the seaside 100-meter zone is 4 thousand hectares. The main difference is that the river does not have a constant mouth losing its waters in sands for filtration and evaporation. The lowlands with no water flow occupy 12% of the water collecting area.

The hydrographic net is represented by numerous branches, which are referred to small rivers of the 2nd and 3d order/status. Spring flooding are not characteristic for the Sagiz river. High level of water occurs during 1-4 days. A group of salty lakes Tentyak-Soi, which are filled with water in some years, is situated in the lower parts of the river.

The riverbed is very meandering. In summer all branches, lakes and the main bed of the basin dry out. Water remains only in separate individual places, 0,1-0,5 km long and 1,5-3 deep.

The Sagiz river across the region has no constant flow for 11 months. The flooding period starts in April and lasts for 22-25 days. The annual flow (95-99%) takes place during this period and totals about 43 million m<sup>3</sup>.

Like flooding waters and, especially after flooding waters of the Sagiz river are highly mineralized (chloral and sodium salination).

Temporary waterflows are found only in spring in land depressions, and in summer they dry out.

Studies conducted by St. Petersburg University in 1992 displayed a significant pollution of water in the Sagiz river by lead and especially thallium (Zhykovskiy and others, 1993).

### **2.3.5.2. Underground waters**

In the hydrogeological respect, the whole Kyzylkok region is situated within the Near-Caspian system of artesian basins. The Near-Caspian system of artesian basins in the geo-structural respect represents by itself a vast and deep tectonic depression, where slightly salty (1-3 g/l, 2 hydro-geological region), salty (3-5 g/l, 3 hydro-geological region), slightly saline (5-10 g/l, 4 hydro-geological region) and heavily mineralized subsoil waters are formed. Besides, a small spot of fresh underground waters (up to 1 g/l, 1 hydro-geological region) has been found in the north-west of the region.

Subsoil waters of the 1 hydro-geological region are situated within the Tisoigan sandy massif. Water bearing here are aolic deposits of the quarter period. Debits of the drilling wells change from 0,1 to 1 l/sec. Capacity of individual water taking points can change from 1 to 10 l/s. Depth of the drilling wells is 30-50 meters.

The underground waters of this region can be used for watering of pastures and water supply of village settlements.

The underground waters of 2 geological district are situated in the north-west and north-east of the region. They are divided by a lane of heavily mineralized waters. Water bearing in the north-west are aolic deposits of the upper quarter period, and in the north-west-upper chalk deposits.

Debits of the drinking wells change from 1 to 10 l/s. Capacity of individual local water taking points can change from 10 to 100 l/s.

Underground waters of this district can be used for watering of pastures and sometimes for water supply of small settlements.

Waters of the 3d hydro-geological district are in the south-east of the region, adjacent to the 4th hydro-geological district. Water bearing are deposits of the upper-chalk period. According to their quality characteristics, the underground waters of this district are useful only for pasture watering.

Underground waters of the 4th hydro-geological district, according to the current norms are even useful for field watering. But with acute necessity they can be used as drinking water for livestock under the supervision of veterinary services.

**PART 3**  
**CONCEPTS AND MEASURES FOR TERRITORY IMPROVEMENT**

### 3. Concepts and measures of territory improvement

#### 3.1. The basic ecology terminology and concept

The term “ecology” was first coined by the German scientist Gekkel E. in 1866. The word “ecology” comes from Greek “oikos” (dwelling, shelter) and "logos" (science). Ecology studies interaction of organisms with the environment and between themselves.

The environment is a place of habitat and production activity which is characterized by interaction with lifeless nature and living organisms. The concept of “environment” includes social, natural and artificially created physical, chemical and biological factors, directly and indirectly influencing the life and activity of people.

In the 20<sup>th</sup> century, in connection with the enormous influence human beings on nature ecology has turned into a science of the rational use of nature and the protection of living organisms. For 70 years the ecology of the human being, or social ecology, the aim of which is to study the rules of the interaction of society and environment, practical problems of its protection has been studied. It includes various philosophical, social, economic, geographical, moral and other aspects (for example, ecology of cities, areas, technical ecology and ecological ethics).

Ecology and environment are frequently are considered as synonymous and connected with the problems of the interaction of human being with nature. By the term “ecology” we understand the preservation of the environment from pollution, clearing constructions-building, regional planning for land use, definition of the value of water, ground, creation of non-polluting technologies, supplying people with high-quality food stuffs, etc.

Within the area of the Earth it is possible to allocate some ecosystems of different degrees of organization. The biosphere is the part of the Earth in which living organisms live and reproduce. The biosphere includes the part of the firm cover of the Earth (lithosphere) and the water cover (hydrosphere). The specific life sphere is living organisms, each of which represents the whole world to parasites living in it.

The biosphere is characterized by the volume of biomass, amount of carbon and the energy linked to biomass, the yearly increase and amount of mineral substances contained in biomass. Living substance of the dry land makes  $10^{12-13}$ t, biomass of woods  $10^{11-12}$  t, mineral substances and nitrogen of the dry land  $10^{10}$  t. Energy of biomass of the land is  $4 \times 10^{19-20}$  kilojoule, the energy contained in dissolved organic substance of the ocean is  $4 \times 10^{19}$  kilojoule. The yearly increase of taiga is 4-7 %, deciduous woods is 10-15 %, yearly increase of a grass of 30-50 %.

The ecological factors influencing living organisms are various, they are useful or harmful, promote or prevent survival and reproduction. Ecological factors are divided into the abiotic, biotic and anthropogenic.

**Abiotic factors** are temperature, light, radioactive radiations, pressure, humidity of air, salt structure of water, wind, currents, relief of land. These properties

of the lifeless nature directly or indirectly influence living organisms.

**Biotic factors** are various displays of influence of living beings on each other. Mutual connections of organisms represent the basis of existence of populations and biocenosis (set of plants, animals and the microorganisms occupying the given part of the dry land or a reservoir – biocenosis of woods, lakes, etc.).

**Anthropogenic factors** are the results of human activity leading to the change of the nature as inhabitanancies of other kinds or directly influencing their lives. During evolution the human being mastered hunting, agriculture, industry, transport and thus gradually changed the environment of the planet. Scales and forms of connections of the human being with nature steadily grew from use of separate kinds of plants and animals up to the practically total involvement of natural resources in the life-support system of a modern industrial society. Now the condition of the earth's mantle and all kinds of organisms is determined by the anthropogenic influence on the nature.

As the biological object, the human being mainly depends on the physical environment. Deterioration of its condition reflects on health of the human being and his capacity for work.

With the growth of industrial forces and the expansion of economic activities the negative consequences of human influence on the environment becomes more and more noticeable. At the present time the negative influences of the human being on nature quite often result in unforeseen changes in ecological systems and in the biosphere processes.

Appreciable damage to the natural environment is caused by oil refining, petrochemical and chemical manufactures, which emissions (sometimes without clearing) are the sources of environmental pollution. The reasons for emissions are the arrangement of the technical equipment on the open areas, its incomplete hermetic sealing, unsatisfactory work of clearing constructions. Also, the atmosphere is polluted with commercial chemical products.

The largest share of emissions comes from motor transport. Exhaust gases from engines contain carbon oxide, hydrocarbons, oxide sulphur, carcinogenic substances (for example, benzapilene), and lead also, as still ethylated gasoline is used.

Also, consumed mineral oils having carcinogenic effects enter the atmosphere with the emissions.

Air pollution: carbon dioxide from exhaust gases of automobiles, from torches of oil refining factories, from mountain - metallurgical enterprises, from torches of petrocrafts creates a “greenhouse effect”, and as a result the dispersion and reflection of sunlight decreases, hence, overheating of the atmosphere is possible.

Dumping the rivers and reservoirs of sewage from chemical and oil refining enterprises causes pollution of water. Heavy pollution of water leads to a lack of oxygen for reproduction and development of bacteria, which decompose chemical pollutants. Connections of lead, mercury, radioactive substances, and also organic pollutant and PAV, including washing substances, herbicides and protein -vitamin concentrates etc are very dangerous.

As a result of tanker-wrecks and the emission of oil from the chinks which take place on the high seas, the sea and oceans are polluted with crude mineral oil. More than 5 million tons of oil annually gets into the World ocean, basically during transport operations (loading of the ballast, clearing, loading and unloading of tankers).

In the seawater under the wind influence, high and low tide oil emulsifies, evaporates, partially dissolves and is exposed to chemical and photochemical oxidation. There is a lack of oxygen for full oxidation of oil in the seawater (for oxidation of 4 l of oil is necessary the amount of oxygen contained in  $1,5 \cdot 10^6$  l of the sea water, saturated with air). Water is polluted with resinous not globules, which pollute beaches as well. The aromatic hydrocarbons affecting almost all sea organisms and also worsening taste of seafood, raising their carcinogenicity, are also dangerous.

For an estimation of the ecological danger of dumping to the local ecological system and biological sphere is necessary to know the structure and concentration of pollution.

At present time there is a sharply-felt deficiency of water as it is not always exposed to effective treatment after use.

Water polluted with chemical substances is not suitable for use in the food-processing industry and in life, because it harms human health.

Pollution of ground influences its fertility. The fertility of the soil is determined by the content of mineral substances: silicon, aluminium, iron, potassium, calcium, magnesium, phosphorus, sulphur, molybdenum, boron, and fluorine.

As a result of the influence on the ground of winds, hurricanes, chemical substances, building of cities, roads, air stations and other constructions, a significant part of the ground is lost. Great harm to ground is caused by irresponsible use of mineral fertilizers, pesticides, etc.

The negative influence of toxic chemical toxic substances on ecological conditions in regions with the advanced industry can be reduced by chemical methods: effective clearing of emissions, development of biologically decomposed PAV and chemical products, fuel for engines of internal combustion with the lowered contents of aromatic hydrocarbons and tetraethyl lead.

During the development of new technologies it is necessary to start with the reduction of water consumption that will allow us to stop dumping of sewage, and to use closed water-recycling systems. The most radical decision for the prevention of the pollution of air, reservoirs and ground is the creation of low-waste and non-waste technological processes.

### **3.2. The basic concepts and actions of the environment protection**

During the epoch of scientific and technical progress, anthropogenous influence on the environment has becomes more and more intensive and scaled. Serious harm is done by the pollution of natural environments - atmospheres, hydrosphere's and

biosphere. In this connection the problems of quality and regulations of the environments condition become the most important.

In a history of mankind there have always been many questions and problems, from the solution decision of which determined well-being and further development of society. However there were never - problems, representing a certain threshold, beyond which the general progress would be either extremely complicated or not possible at all.

Nowadays it is obvious, that mankind has approached the end of 20<sup>th</sup> century burdened with problems created during previous centuries.

In the interlacing of social, economic, and political contradictions of our times special attention is given to the contradictions of global scale touching the bases of the civilization`s existence. And such problems as environmental pollution, air pool and oceans, and the exhaustion of natural resources have become rather acute.

The environmental problem (as a set of questions of environmental preservation and rational use of natural resources), being a global problem, infringes the interests of all five billion people our planet, the interests of all modern states without exception and, ultimately, the interests of each human being living on the Earth.

Maintenance of ecological priorities becomes an increasingly important element of social progress. These priorities gradually assume the character of absolute values. Hence, even today, and furthermore in the future, any economical or political decision, which goes against scientifically, proved medical, ecological and other requirements for the environment, is basically unacceptable. To ignore fact would be means sacrificing destiny of society, and the life not only of present, but also of next generations to the self-interested and egoistical interests of the present day.

The complexity, diversity and discrepancy of environmental problems complicates the development of a universal strategy of ecological behaviour and impedes the process of development of the most comprehensible way for the social development during the epoch of the scientific and technical revolution.

It is possible to identify the three basic components of the environmental problem:

- a) Biological,
- b) Technical,
- c) Social and economic.

However there are many different directions and aspects of an ecological problem. These are questions of economy, ethics, monitoring, quality management of the environment, etc.

Despite the serious importance of biological and technical components, the scale and the discrepancy of the third - social and economic becomes more and more evident as the complexity of this question is determined by the objective ambiguity of process of interaction of society and nature. Here, rules of development of nature and society are bound, the biological "interests" of nature and social requirements of a society "come face to face".

Under the conditions of the intensive use of natural resources by the human grace, their involvement in economic activities causes more and more noticeable damage to nature, which began to lose its unique ability of self-restoration. Natural biological cycles are broken, developments are broken, and nature more and more feels the powerful "volley" influence of its society.

Today, mankind should answer a question: society capable of preventing a global ecological crisis or is it doomed for destruction due to the exhaustion of natural resources and super pollution of the surrounding natural environment?

What is the problem? What are the reasons for this extremely adverse ecological global situation?

Let's look at the general picture of the economic development of the modern world.

The world economy is annually capable "out of extracting over" 800 million tons ferrous metals, more than 60 million tons of synthetic materials, about 500 million tons of mineral fertilizers, up to 8 million tons of chemical weed-killers, over 300 million tons of organic chemical compounds of 150 types, etc.

Due to the work of industry into atmosphere in the second half of the 80-s was emitted more than 300 million tons of carbon oxide, 50 million tons of possible hydrocarbons, 120 million tons of ashes, 150 million tons of dioxide sulphur, and 6-10 million tons of crude oil got into the waters of the World ocean, the firm drain rises up to 17 million tons of.

Besides this, for irrigation, industrial production, and household supply the mankind uses already more than 13 % of river drain and dumps into reservoirs up to 500 billion m<sup>3</sup> of industrial and municipal drains a year, and their neutralization (depending on the degree of treatment) demands 5-12 % of natural pure supplies.

Pollution of the biosphere, exhaustion of natural resources, destruction of ecosystems, loss of natural ability for self-restoration - all these are extremely dangerous and complex processes, development of which is caused and stimulated by the economic activities of the human beings. At the present time many kinds of polluting substances, for example metals, the dust, pesticides, radioactive substances, in connection with atmospheric and hydrosphere circulating processes go up to the regional and global level, transforming the planet into a uniform techno biology system.

Such changes in the natural environment do not occur without leaving a traces of human activity. In opinion of physicians and experts in the field of sanitary hygiene, emissions from industrial enterprises contain up to 150 substances harming the health of people. The fact, is that many modern human illnesses are connected to occurrence in the environment of products of chemical manufacture and transport emissions, this causes anxiety, and it should be taken into consideration that a number of polluting substances have mutagenic properties, capable of changing even the heredity of the human being.

Scientists, experts, and representatives of the public, with increasing concern,

speak about the display of “feedback” during the interaction of society and nature.

It is known, that people’s health under modern conditions depends 15-20% on the condition of the environment. Experts affirm, that the intensive pollution of atmospheric air by chemical substances, increasing contact of the human being with the artificially synthesized materials result in changes to the immune system. A percentage of mankind already has an essentially disrupted immune system, and society is compelled to spend enormous money to tackle these disasters.

Moreover, this danger is so significant, that, in opinion of the French scientist Morua M., it is necessary to create conditions for the preservation of nucleonic acids in our cells, giving us the history of our genetic back ground should be threatened with danger.

During the last 15-20 years the environmental problem has attracted not only the serious interest, but also the deep concern of many experts, scientific, politicians of the word wide community. Long ago, the problem of «nature protection» stopped being just a modern activity. Now the question is to solve the vital problem of protecting the health protection of living and future generations from the harmful consequences of scientific and technical progress and economic activities.

During the epoch of scientific and technical revolution there was a paradoxical situation: on the one hand, knowledge and technical opportunities of the human being formed the a basis of creation of powerful productive forces, capable of conduction an active approach to the nature, to change the face of the Earth, subordinating the environment to the interests of a society, and on the other hand lack of knowledge especially in questions of the environment, limiting the ability to estimate completely and correctly the degree of influence of the productive forces of society on nature.

The enthusiasm of the human being for "successes" during interaction with nature, “victories” over it has led to the situation that that these "victories" became his defeat. And even more so the inaccuracy and illusiveness of such "victories" are obvious, that the great thinkers Marx and Engels wrote and warned over a century ago: “However, we should not be under such a delusion with our victories over nature. Each such victory it revenges on us. Each such victory has, really, first of all those consequences which we expected, but in the second and third turn absolutely other, unforeseen consequences which very often destroy the value of the first”.

Moreover, in Engels’ words, this «revenge of nature» in the form of unforeseen consequences, will be shown independently of any social organization, i.e. in conditions of various social and economic formations.

Long spontaneous use of natural resources by humans, lasted in general in rather favourable conditions both for society, and for nature, has created a specific social - psychological statement concerning the treatment of the human being of the natural resources surrounding him. There was a belief, that in spite of the scales of human activity, its influence on the nature would be minimal, or would have only a local character.

However at the present time the system of society – hyphen nature has turned

out to be functionally closed. Nature acts in relation to society not as a boundless and amorphous environment, but as a functional system transforming the results of economic activities into new factors which then appear and which society should take into consideration.

That's why the question about the development of a common scientific concept becomes extremely important, because on the basis of this it would be possible meaningfully, purposefully and with optimum results to carry out the process of interaction between society and nature.

During researches the condition of preservation of the environment of Atyrau area the authors developed the basic concepts of the environmental problems and as a result of the work carried out over the last 8-9 years the following list of actions on each question has been produced.

### **3.2.1. Protection of air pool**

#### **Conceptual positions**

1. Perfection of existing and introduction of new technological processes and the equipment for observance of specifications of limiting influences on atmospheric air.

2. Catching, recycling and, neutralization of harmful substances and waste products or full exclusion of emissions of polluting substances, fulfilling of other requirements on the protection of atmospheric air, especially by the objects of the oil and gas extraction complex, companies processing hydrocarbonic raw material (oil and gas), including petrochemistry, power and thermal stations, and also the enterprises of motor transport.

3. Inventory of sources of pollution of the atmosphere determining the amount, structure and classification of toxicity, - development of specifications of these emissions and concrete recommendations on reduction of air pollutions.

4. Determining the connection between human health (parameters of disease, death rate, etc.) and the level of pollution of air pool and taking the corresponding measures.

#### **Recommended actions**

For determination of the principal causes, ways and conditions of pollution of air pool of the Atyrau area and the complex estimation of the ecological condition of the air, including the level of harm for the population health, amount and structure of harmful substances emitted specific sources of pollution, and foundation of the modern generated (including ecologo-medical) situations in the area, and the following preventive Maintenance of, and improvement of an atmosphere of area, it is

necessary to consider the following:

1. To finish development of specifications for limiting allowable emissions (LAE) into the atmosphere for all more or less large enterprises of the area, to introduce them into the production and strictly monitor their execution.

2. To investigate for building zones of Atyrau and settlements of the city, enterprises and separate shops, large motor depots and to see where the largest amount of emissions in the atmosphere of polluting substances comes from and falls.

Concerning such enterprises, for example, in Atyrau foundry and forge - pressing workshops, a machine-building factory of Open Society "Zamanmash", joint-stock company "Shelf" (a mechanical factory), Atyrau meat-packing plant and bakeries № 1 and 2, large motor transportation enterprises, etc.

3. The most effective actions to reduce the emissions into the air of especially toxic gases - carbon oxide, nitrogen dioxide and sulphurous gas (sulphur dioxide), flying hydrocarbons - are:

3.1. Replacement of black oil by vacuum distillate, which is even better for hydrocarbon gases.

3.2. Gradual conversion of motor transport (especially lorries) from petrol engines to diesel, and then to gas fuel. To adjust a network of diagnostic and regulating items in all motor transport services where is maintained more than 20-25 machines, and strict monitoring of maintenance of the norms of structures of exhaust gases.

3.3. To adjust the long term planned introduction of unleaded petrol line by the joint-stock company "ANPZ"- and to introduce catalytic converters on exhaust pipes. This measure simultaneously, with the reduction of the amount of carbonic monoxide exhaust, will result in the full absence from exhaust gases of the lead compound which poison the atmosphere when us as an anti-knocking additive.

3.4. To carry out conversion the boiler-houses to gas and to liquidate small boiler-houses with low pipes. To carry out full conversion of the boilers at Atyrauskoj thermal power station to gas and to introduce at this station special catalytic equipment developed by Kazakhstan scientists, which uses the reaction between toxic oxide carbon and dioxide nitrogen with reception of harmless gases (molecular nitrogen and carbonic gas).

3.5. With the purpose of improvement of passenger transportations in the regional centre without increasing the number of motor transport to build 9,5 kms of trolleybus lines the first turn and construction of trolleybus depots for 30 machines. By calculation, in the first turn 23 trolley buses should be acquired.

4. In designing new enterprises, strictly to observe the norms stipulated by laws, on the creation of sanitary - protective zones (CSP) of sufficient width.

From earlier established CSP, to take out inhabited constructions and settlements, for example, the settlement of Sarykamys, situated in CSP Tengiz gas-transferring factory.

5. One of the significant sources of pollution of the atmosphere (not only

atmospheres, but also subsoil waters) are spontaneous dumps of industrial economic waste products and sediment bowls (a field of evaporation) industrial and household drains (especially “the Rotten beam”).

It is necessary to leave only some ordered dumps and only outside settlements; sediment bowls should have reliable protection and whenever possible a box from impenetrable materials (the stamped clay, plastic film). It is necessary to organize ranges for neutralization and burial places of toxic waste products.

6. For reduction of air pollution by oil hydrocarbons it is necessary to update reserve park on crafts and the oil refining enterprises and the equipment blocking of the open surfaces of capacities, and also to achieve liquidation of unorganized emissions at bitumen factories, steaming stations and manufactures of asphalt - concrete mixes.

7. The establishment of the new powder-gas catching equipment (effective filters, cyclones, wet clearing, electro filter, etc.), and also modernization and putting in order of the old filters we can achieve marked decrease of air pollution both inorganic and organic (for example, coke) dust and harmful gases.

8. One of the main defenders of ecological quality of air is green plantings. They have especial value in the desert and semi desert climate of Atyrau area. Green plantings produce oxygen and clear air of a dust, but also protect settlements from strong winds and dust storms, i.e. they play a role in making the environment.

It is necessary to achieve, that for each inhabitant of area was not 2-2,5 sq. m of green plantings as now, but the area of them should come nearer to sanitary norms, i.e. up to 12 sq. m per a person. An important role should be played by not only creation of new plantings, but also by the preservation of old plants (care of plants, regular watering, pest control, etc.).

### **3.2.2. Protection of superficial and subsoil waters**

#### **The concept on preservation of water resources**

- studying the characteristics and conditions of surface and subsoil waters;
- maintenance of rational use of waters for the needs of the population, branches of economy;
- protection of water resources from pollution, contaminations and exhaustions;
- clearing and additional cleaning of sewage.

#### **Recommended actions**

1. Carrying out technological, forest amelioration, the agrotechnical, hydraulic engineering, sanitary and other actions providing protection of surface and ground

waters from pollution, contamination and exhaustion, and also improvement of their condition and rate.

2. Development of the basic directions of rational waters use, and also carrying out of water-security strategies.

3. Drawing up circuits of complex rational use and protection of water-economic reservoirs and the development of measures for reduction of water consumption and wide secondary use of waters in work cycles of manufacturers.

4. Maintenance of strict and full execution of the state water regulations and development of instructions for use and measures on protection of the concrete water sources.

5. Forecasting the changes of hydrological conditions, water content of the rivers and quality of waters for preservation of waters with the purpose of supplying future population and economic requirements for water at maintenance of ecological stability of the environment.

6. To establish water-security zones and strips from the banks of rivers and reservoirs for maintenance of a favourable mode of the rivers and reservoirs, the prevention and silting, obliteration, water erosion of the ground, deterioration of conditions of fish and birds habitats reduction of fluctuations amplitude of drain and also to provide carrying out of forest amelioration, antierosion, hydraulic engineering and other nature protection actions.

On the territory of water-security zones and strips, to forbid ploughing up the grounds, bathing and sanitary processing of cattle, erection of constructions and other kinds of economic activities worsening condition of reservoirs.

7. The mode of operation of constructions for fence of underground waters should exclude exhaustion and pollution of their stocks.

8. Underground water-bearing horizons opened at work exploration, investigation and operation of deposits of hydrocarbon raw material and other kinds of minerals, should be reliably isolated to the prevent their pollution.

9. Passing oil (stratal) water brought to the surface during oil and gas recovery, should be utilized by pumping it back into underground horizons for maintenance of bedded pressure, or used for other technological purposes, or in different ways.

10. Barriers and recording devices should be used for the, preservation or liquidation of self-emission artesian chinks, and also the chinks unsuitable for operation, or no longer in use.

11. In the field of feed underground or subsoil waters which are used or can be used for water supply, storage of solid and liquid waste products, and also the construction of other objects being sources of pollution of underground waters should not be permitted.

12. To carry out coordinated controls of water resources for the restoration of water content of the small rivers and to preserve the cleanliness of their waters, and also to take measures for the prevention and liquidations of pollution, contamination and exhaustion of the small rivers; to lead works on maintenance of a favourable

water condition and appropriate sanitary condition of the rivers.

13. The organization of monitoring of waters quickly detect changes, their estimations, of prevention and elimination the negative processes by use of space supervision and creations of a network of ground points for supervision of the condition of surface waters.

14. Drawing up of water-economic balances on water pools, economic regions for estimation of dynamics of an effective utilization of waters and the account of their presence.

15. Creation of system of organizational, economic, legal and other measures directed at prevention of pollution, contamination and exhaustion of waters and rational resource-saving uses of water.

16. The organization of permanent (high water) the commissions at enforcement authorities in areas where the rivers Uil, Sagiz proceed, Emba and east sleeves of Volga (Kigach, etc.) to supervise construction of dams and dikes on the low coast of these rivers to prevent repetition of the catastrophic consequences of the abnormally high waters at the beginning of the 1990.

### **3.2.3. Protection of mineral sources and the geological environment**

#### **The concept on protection**

1. With the purpose of maintenance of interests of the present and the future generations, Maintenance of scientifically proved rational and careful attitude to **mineral sources** as a whole in the geological environment.

2. Complex use of a mineral-source of raw materials for the satisfaction of needs for minerals, underground waters and other needs of a national economy with the indispensable account of observance of ecological conditions and resource-saving reasons.

3. Maintenance of protection of minerals with observance of technical-operational circuits, and also protection against harmful influence of the development on separate components of the natural environment.

4. Considering the extreme vulnerability of landscapes of the territory to mechanical techno genesis, to chemical and oil pollution and high rates of developing industrial - economic development of the region for the prevention of degradation of its natural environment maintenance of the acceptance of urgent measures for regulating anthropogenous influence on them.

## **Recommended actions**

1. Creation and introduction of effective systems of working in mined sources, without waste and low-waste technologies of extraction and processing of raw material.
2. Protection of sources of minerals from exhaustion (maintenance of bedded pressure), pollution, irrigation, fire and other undesirable factors lowering the quality of minerals and industrial value of sources or complicating their development.
3. Reduction of loss at extraction and transportation of raw material.
4. Maintenance of resource-saving principle: completeness of extraction of minerals and components, rational and complex use of them.
5. Maintenance of separate working off stocks of poor sub-standard ores and their storing on the industry stations territory.
6. Prevention of harmful influence of the works connected with the use of sources, on the condition of the surrounding natural environment, safety of the executed and temporary closing-down of mountain development and boreholes.
7. Maintenance of the authentic account of the taken stocks and together with them of unmined minerals and the components of raw material in passing extracted overburden stratum contained in them, underground waters, etc.
8. Prevention from pollution of sources during the work linked with the mineral extraction, and also at underground storage of oil, gas, dump of sewage, etc.
9. Prohibition of building up on areas of minerals deposits.
10. Preservation and recultivation of landscapes and separate geomorphological structures by development of minerals deposits.
11. Addition of the cadastre of deposits, displays of minerals, waste of extraction.
12. It is necessary to stop the uncontrollable movement of transport and create of an infrastructure of oil-extracting and industrial - city complexes to start with construction of roads with a rigid covering (with drainage pipes). During building work it is necessary to take into account engineering and hydro-geological conditions, and, not allowing the uncontrolled excavations in the area of Atyrau, the Tengiz complex and many other places to formation man-caused saline soils. For preservation cleanliness of the water-bearing horizons which are really precious, application casing pipes during hydro-geological drilling, search and other chinks and is necessary for the isolation of horizons. The control over observance of recommendations is necessary for storage of mineral oil in the open air, prohibition of dumping of mineral oil and bedded oil waters in saline soils and lake, control over the condition of and repair of product pipeline. In the area of development of significant sandy files, in transitive landscapes and of some alluvial plains, it is very dangerous over pasture cattle, as this can provoke processes of wide desertification; therefore the cattle breeding here should have a nomadic character (this does not apply to other areas, where danger of desertification is less).

### **3.2.4. Protection of the grounds and soils**

#### **The concept of protection**

1. Maintenance of scientifically proved rational use of the grounds and soils for the needs of the population, branches of economy and the environment.

2. Realization of measures on protection of ground resources and soils from flooding, bogging, salination, pollution, contaminations, exhaustions, preventions and liquidations of harmful influence, strengthening of legislation in the field of ground relations.

3. Carrying out the effectual measures to increase of soil fertility, realization of the complex of organization-economic, agrotechnical, meliorative and hydraulic engineering actions on prevention of wind and water erosion soils, on recultivation of the disrupted grounds.

#### **Recommended actions**

For protection and rational use of the grounds and soils the following measures should be taken:

1. Realization by land users of rational planning and organization of the territory, providing ecologically and economically rational distribution of the farms and their internal device.

2. It is prohibited to use objects and application of technology, which have not been provided, with measures for protection of the grounds from degradation.

3. Restoration and increase of soils fertility, and also other properties of the grounds. Increase of efficiency of natural haymakings and pastures.

4. Protection of the grounds against water and wind erosion, flooding, bogging, secondary salination, dehydration, condensation, pollution and contaminations waste products of manufacture, chemical and radioactive substances, from fires, and other processes of destruction.

5. Introduction of a scientifically proved system of pasturing cattle in system of haymaking rotation turns.

6. Protection from obliteration of the agricultural farms with bush and low forest, protection from plants, from other processes leading to deterioration of cultures, and technical condition of the grounds.

7. Preservation of the degraded agricultural pastures where it is impossible to restore soil fertility.

8. Recultivation of the broken grounds, increase of their fertility, other useful properties of the ground.

9. Removal, use and preservation of a fertile layer of ground at the work connected with the ground breaking.

10. Expansion of the system of nature protection territories.

11. Concentration of industrial activity in the range of strictly limited zones with a view of preservation of fund of undisturbed grounds.

12. Development of circuits of perspective use of the grounds on the basis of an estimation of territorial - resource combinations of uncultivated or moderately cultivated land.

13. The organization of monitoring of the grounds, representing a system of tracking the condition of ground fund for duly revealing changes, their estimations, the prevention and elimination of consequences of negative processes.

14. Addition of a ground cadastre with the indication of quantity and quality of the grounds, appraisal of the soils and an economic estimation of the grounds.

15. Conducting a meliorative cadastre on the irrigated grounds.

16. Carrying out forest amelioration works on creation of protective plantings on the grounds of agricultural productions, land tenure settlements of city type, protective strips along railways, etc.

### **3.2.5. Protection of plants and animals**

#### **The concept of protection**

1. Maintenance of effective protection, reproduction and rational use of plants and animals, bringing up the present and the future generations in spirit of the careful and humane attitude to the wildlife.

2. Creation of conditions of existence and growth of the local florae and faunae in a condition of natural freedom.

3. Preservation of specific variety and integrity of their natural communities.

4. Maintenance of an effective control over the condition of the plants and animals of the area, especially over the rare and endangered species.

#### **Recommended actions**

1. To provide rational use of wild fauna - fish, wild animals, birds and other living beings, not allowing their barbarous destruction.

On the basis of recommendations of scientific institutes an establishment of interdictions or restrictions in using plant communities and fauna on the certain territory and for the certain terms.

2. During accommodation, design, and construction of the enterprises, constructions and other objects, introduction of new technological processes, land reclamations, carrying out of prospecting works, extraction of minerals, definition of pasture places and run of agricultural animals, provision should be made for the preservation of flora, for the maintenance of inviolability of habitats and breeding grounds of animals. Thus inviolability of the places representing special value as an

inhabitancy and growth of flora and fauna should be provided.

3. During accommodation, designing and construction of highway, pipeline and other transport highways, electric mains and connection, channels should be developed along with actions for minimizing damage to flora and full preservation of ways of migration and places of animal's concentration.

4. Actions which might destroy reduce or infringement conditions for the growth and dwelling of any kind of rare flora and fauna under threat of disappearance are forbidden.

5. Creation of reserved zones, reserves for preservation of valuable populations of plants, water-lake birds of passage and other animals.

6. Storage of materials and waste products of manufacture, reed mow cleaning, burning of dry plants, development of river-bed having spawning value for prevention from harmful influence or destruction of fauna and flora is forbidden.

7. With a view of prevention of harmful influence or destruction on plants and animals the enterprises, the establishments, separate citizens are obliged to observe rules of transportation, storage, application of means of protection of plants, mineral fertilizers and other preparations used in agriculture.

8. In a coastal strip of Caspian Sea for preservation of dwelling-place of valuable trade kinds of fish, wintering and nesting of huge numbers of water-marsh birds, and seals:

- to allocate 10-kilometer from the shore line in prohibited zones on the whole coast of Northern Caspian sea for preservation by a bordering wide strip of coastal vegetation with communities of birds and animals, and reduction of sea pollutant amount;

- to isolate washout centres of oil from open oil storages, deposits, separate oil wells;

- to create special perches on lines LET for birds;

- to protect seals habitats from poachers and pollution;

- to forbid amateur and trade hunting, or catching fish without a license;

- to exclude application of chemical means and to adjust its transportation.

9. Construction of a sturgeon fish-breeding factory for the restoration of the number of valuable and food fish in the Ural.

10. To deepen and clear out the mouth of the Ural and its inflows for improving the condition of fish migration paths.

11. To take measures for the restoration of potential areas for spawning in the Ural, and also for increasing the efficiency of the existing ineffective spawning.

12. To strengthen the struggle against poaching, illegal fishing. To toughen rules of amateur fishing and hunting for animals. To define places and terms of fishery and hunting.

13. Constant revision of hunting area borders in the coastal strip of the Caspian sea is required considering the flooded areas and allocating zones of rest and reproduction.

14. To strengthen the control over protection, reproduction, use and condition of changes of numbers of flora and fauna under influence of economic or other activity, prompt suppression of infringements of requirements of the legislation on protection, reproduction and use.

15. Maintenance of rendering assistance to wild animals in cases of diseases, imminent death due to acts of nature, poisoning and other reasons.

16. To arrange preservation and increase the wood fund of area; to increase the areas for forest amelioration plantings; to forbid preparation of wood, burning out cane on the banks of river, and lakes.

17. Maintenance of carrying out the account of quantitative changes of flora and fauna number, conducting the state cadastre on them.

18. Writing down the additions and changes into the Red Books of the Republic of Kazakhstan, entering the data about rare kinds of plants and animals and those which are under the threat of disappearance.

19. Education of citizens in the spirit of a humane attitude to plants and animals.

20. Realization of actions for international cooperation in the field of protection, reproduction and use of fauna and flora.

21. The organization of scientific researches directed to a substantiation of measures on protection and reproduction of fauna and flora.

### **3.2.6. Protection against spontaneous destructive phenomena**

#### **Conceptual positions**

1. Monitoring concerning the level of the Caspian sea and creation of a computer model for possible flooding of the coastal strip by sea waters because of a change in the background mark of the Caspian sea and wind bottom water set.

2. The organization of design and construction for the protection of settlements, industrial and economic objects, oil-and-gas deposits and other infrastructure.

3. The organization of gradual resettlement of inhabitants of settlements, transferring of roads, LET, etc. in cases in which protection against flooding are inexpedient and inefficient.

4. Preparation of flooded territories with a view to preventing the pollution of sea water by mineral oil and others pollutant - clearing of the coastal areas laying below the mark -26,0 m abs., conservation of old chinks, sanitation of former oil bankers and technological platforms, etc., etc.

5. Adjustment of grange actions on impounded territories, drainage systems, the observant wells, etc. also services of tracking the level of subsoil waters and their cleanliness.

## Suggested actions

1. Taking into account a specific feature of Atyrau area consisting of the change of the water-level of the Caspian sea, constant migration of the coast, and also the absence of the base initial data on the level mode, it is expedient to create in the field a system of observation posts along the coast, and also in flood-lands and deltas of the Volga and the Ural, and also the creation of a computer database of the level parameters of the Northern Caspian sea and the Ural.

2. For the organization of resettlement of the population from flooded settlements in Atyrau area it is necessary to execute, in probably shorter terms, circuits of this resettlement from coastal zone Kurmangazinskiy, Isatayskiy and Balykshinskiy areas, and also the circuit of resettlement of inhabitants from Shubartpaly village and work-village Sarykamys Zhylyojkiy area. Circuits should be accompanied by maps of Scale 1:25000.

It is necessary to execute the in short term topographical survey and engineering research in Scale 1:2000 platforms of resettlement with the subsequent development of general plans for new settlements. In 1996 it is necessary also to perform works on the choice of platforms for perspective construction and to make allotment of the ground areas. The beginning of constructing the new settlements should be planned for 1996-1997.

In connection with absence of the authorized forecast of the water-level mode of the Caspian Sea, it is necessary to develop a new type of habitation for the considered region satisfying existing conditions. Probably, it will be a mobile habitation.

3. With a view of protection of highways and constructions of an engineering - transport infrastructure and maintenance of normal functioning of these important economic objects it is necessary to perform the following works urgently:

- development of actions on maintenance of the reliability of water delivery from a water-fence on the Kigach up to Kulsary village on the Astrakhan – Mangyshlak water way, in case of flooding with coming wave;

- the TEO of the Karabotan-Novobogatinskoe-Astrahan highway;

- the TEO of railway transition through the Ural considering the construction of the Kulsary-Makat-Inderborsky-Aleksandrov Gay trunk-railway;

- the TEO of development of Atyrau airport with an opportunity of its carrying to a platform outside of the zone of flooding;

- technical actions on using the main pipeline transport in conditions of flooding of the coastal strip of the Caspian Sea;

- equipment designs of constructions of the electrosupply which is taken out from the zone of flooding (substation “Shortanbay”, “Alga”, “Akkistau”, “Ganyushkino”, and also high-voltage lines (HL) 110 kV “Akkistau - Ganyushkino – Shortanbay”);

- equipment designs of substation on 500 kV “Atyrau” and “Kulsary” and HL 500 kV “Uralsk – Atyrau”, “Atyrau – Kulsary”, “Aktyubinsk – Kulsary”;
- construction of the projected ring dams in the coastal zone and the dams protecting the Ural coast from flooding with high water;
- clearing, deepening, strengthening river-beds and sleeves of the Ural old delta;
- creation of hydrodynamic computer model of the sea level and a condition of the coastal zone in close coordination with the current meteorological pressure and geographical features of the concrete forecasting areas for east part of the Northern Caspian sea similar to computer models of the Caspian sea, the Northern Caspian sea and a detailed model of the Northwest coast, created by the Russian firm " Volga " in 1993-1994.

For the steady functioning system of trunk-railways in conditions of catastrophic rise of the Caspian Sea it is necessary to build a trunk-railway from Aleksandrov Gaj-Inderborsky and further to Makat, Kulsary, Mangistau instead of the direction to Atyrau-Astrakhan.

The great bulk of the oil deposits in Atyrau area is concentrated in a coastal strip of the Caspian sea and it is flooded by the coming sea, and bottom water set processes. By this time a number of deposits, such as Morskoe, Kokarna, Pribrezhnoe, Pustynnoe, South-West Tazhigaly, Martyshy, Kamyshitovoe, etc have been flooded.

With the purpose of protection of oil deposits against flooding by seawater and for the protection of the Caspian sea against oil pollution and the preservation of ecological equilibrium in the coastal zone it is necessary to make works on the following:

- construction of protective dams (ring and face-to-face) with strengthening slopes and a construction of drainage system;
- to make pouring technological platforms by analogy to the petrocrafts of Western Siberia with raising chinks mouth and the process equipment;
- transmission of the underground part and ground pipeline transport and other communications on platforms;
- updating engineering protection of petrocrafts, including the Tengiz deposits;
- recultivation (designing and realization) of the disrupted in the zone of the inhibited deposits;
- to pay special attention to maintenance of the ecological cleanliness of all prospecting, drilling and operational works on development of oil and gas fields on the shelf of the Northern Caspian sea.

### **3.2.7. Protection against radiation pollution**

#### **The concept of protection**

1. It is necessary to declassify and publish the basic documents concerning activity of military ranges in Atyrau area, especially connected with explosions of nuclear devices and radiating metering of the “Azgir” range.

2. Maintenance of the radiating monitoring on the territory of former Azgir nuclear range, including burial places of a radioactive ground and metal designs.

3. Maintenance of the final deactivation and recultivation of the grounds occupied by the ranges “Azgir” and “Taysoygan” ranges. Full clearing of rocket ranges from fragments of military equipment.

4. Maintenance of the complex inspection of the population and the environment of territories of the former ranges, including medical inspection of inhabitants, definition of the radiation level and chemical infection of territories (ground, water, wells, etc.) and calculation of the damage to the people’s health and the national economy by the activity of the ranges.

5. A quick decision of the question of the necessity to resettle the inhabitants of settlements Azgir and Balkuduk to more healthy places.

6. It is necessary to calculate the amount of compensation to the population living in the territory of ranges, and also in a strip of 50 km from the borders of ranges, for infringement of health and for higher risk in comparison with further located districts.

To press for compensation payments made directly to the permanent residents of this zone at the expense of the Ministry of Defence and Minatomenergoprom of the Russian Federation.

7. It is necessary to press for distribution of the privileges stipulated for inhabitants of the Semipalatinsk nuclear range zone, for the population of the nuclear range zone “Azgir”.

8. In case of continue activity at some sites of rocket range “Taysoygan” under the contract between the Russian Federation and Republic of Kazakhstan, it is necessary to organize the work of the joint ecological commission which is carrying out monitoring and control over the environment of this territory.

#### **Recommended actions**

1. To declare the territory of the Azgir and Taysoygan ranges to be zones of ecological disaster and to distribute the corresponding status to their inhabitants.

2. To organize constant monitoring (supervision) over radiological and toxicological conditions on the specified ranges and for this purpose to organize specialized group.

3. To organize complex inspection of inhabitants in ranges territory, to establish

constant control over the condition of their health, to organize special medical, material and food support for the ranges population, to move inhabitants of the Azgir settlement and the Balkuduksky, state farm to a “healthy” territory.

4. Finally to finish deactivation and recultivation of the grounds, which have been, occupied by the “Azgir” and “Taysoygan” - ranges. To provide full gathering and export of all fragments of military equipment from the territory of all sites of the rocket ranges. To hand over revegetated sites of former territories of ranges according to the certificate to the national economy.

5. To press for reference of indemnification for damage to people and nature on the territory of the ranges, not only and not so much to the account of the given area and the Republic of Kazakhstan, but, mainly, to the account of Russia (by estimation the damage in Azgir is about 500 million rubles at prices for January, 1, 1992).

6. In case of continued activity of some sites of the rocket range under the contract between Russia and Kazakhstan, it is necessary to create a joint ecological commission from representatives of these two countries which will carry out monitoring of the condition of the environment of a new range.

### **3.2.8. Protection against industrial and economic waste products**

#### **Conceptual positions**

The concept for controlling waste products is the following:

1. Perfection of the existing, equipment elimination of obsolete, introduction of low-wasted or without waste technologies in industry, transport, and agriculture.

2. Maintenance of the account, storage, neutralization, recycling and burial place of waste products, organization of special ranges for waste products, construction of incinerators factories.

3. Use of secondary resources, and also parts of industrial, economic waste products for needs of the national economy.

4. Liquidation of non-authorized dumps, fields of evaporation, sanitation of their areas and recultivation of the grounds released from dumps and liquid waste products.

#### **Actions for protection**

With a view to the prevention of environmental contamination with toxic factory waste, it is necessary to introduce the methods for their neutralization approved in practice: combined processing of industrial wastes partly with household waste at biothermal composting factories, factory combined burning with household dust, warehousing of factory waste with household waste products range.

And only highly toxic and toxic unused (at absence of technology of recycling, capacities on use) industrial wastes can be taken out to the range of neutralization and

a burial place of toxic industrial wastes according to Rules 2.01.28-85.

Recommended variants of platforms for such ranges are:

a) territory 115-120 km to the east - southeast of Karaton village, 235-240 km to the east - southeast from Atyrau;

б) territory in 180-190 km to east - northeast of Atyrau, in the area of the settlements of Aktas and Zhanterek; both territories are near to the border with the Aktyubinsk area.

Carrying out the engineering - geological researches is required for the organization of these ranges.

Taking into account the tendency of growth of volumes of defective ferro-concrete and other building designs, and also ash-and-slad and other waste products, for example, cullet, papers for recycling, rags, the plastic, concerning to the category of secondary resources, it is recommended to organize their warehousing for the further recycling.

Potential waste products of the secondary resources category, to processing and use in the industry of building materials are unrecycled oils, mixes of black oil and mud, mud electroplating. Use of these relieves the neutralization on range of burial place toxic industrial wastes.

Use of industrial wastes should be ecologically justified; it is necessary to be coordinated with bodies of public health services. Taking into account dispersion of the enterprises, the high cost price of production, difficulty of recycling of waste products because of small volumes and for other reasons, it is represented to be expedient with a view of recycling waste products of the secondary resources category to organize a uniform (on regional-resource circumstances), specialized enterprise.

For regulating and utilization of the increasing volumes of waste products it is necessary to take the following measures:

1. Maintenance of inventory and account of changes according to the waste products types of various branches of a national economy.

2. Perfection of system of gathering, recycling and warehousing of household waste and industrial firm waste products.

3. Construction of plant or factories for processing household and other solid waste products.

4. Perfection of technology of existing manufactures improvement of chemical and biological sewage treatment, introduction low-waste and nowaste technologies.

5. Ideas for manufacture of new products from waste products of industry, transport, and agriculture.

6. Maintenance of use in the national economy of secondary resources - scrap metal, cullet, paper for recycling, used plastic, used oil, old tires, ash-and-slag, wood, nonferrous metals, building waste, etc.

7. Carrying out the deactivation of the areas occupied by fields of evaporation around Atyrau city and other industrial objects.

### **3.2.9. Public health care**

#### **The concept of perfection of the population health services**

The basic directions for perfection of the population health services of the area with a view to protection and strengthening of health are:

- a preventive orientation of activity of public health services establishments with the purpose of disease prevention by promoting a healthy way of life, health education for the population, the organization of a system of the state social and economic measures directed at elimination of factors and conditions harmfully influencing the citizens health;

- reforming of the system of public health services, directed at the creation of medical insurance, keeping at this the state budgetary financing and being free of the guaranteed volume of medical aid, development of private medical practice, paid services and other forms of health services, providing it with multiformity;

- improvement of medicinal maintenance of the population, providing guaranteed reception of the safe, effective and qualitative medicinal help in any chemist's, treatment-and-prophylactic organization irrespective of departmental subordination and pattern of ownership.

#### **Recommended measures for improvement of health services**

The analysis of the health condition of the population of the area and parameters of activity of public health services establishments during recent years, definition on its basis the directions of perfection of health services dictate the necessity of acceptance for these purposes the following measures:

- strengthening of material base and improvement of activity of establishments for rendering out-patient - polyclinic help to the population;

- improvement of health services of the population by development of the highly skilled specialized help on the basis of existing hospitals and clinics;

- development of a network of sanatoria - dispensaries intended for the restoration of work capacity and rehabilitation of health;

- health education for the population, promotion of a healthy lifestyle, using all kinds of media and individual forms of work;

- transition to the obligatory medical insurance of all citizens, as the form of their social protection and rendering of medical aid within the framework of the base program of obligatory medical insurance, creation of funds for compulsory insurance;

- development of rendering of paid specialized services over the guaranteed volume of help;

- development of private medical practices;

- privatization of pharmacies, creation of establishments of various patterns of ownership, the establishments realizing medical products under state control and on the basis of licensing of their activity;
- improvement of the state sanitary-and-epidemiologic supervision of the sanitary condition of settlements, the condition of drinking water supplied to the population, immunization from infectious diseases;
- development of social and medical measures preventive maintenance and treatment of tuberculosis, using recent achievements in medical science and practice.

### **3.2.10. Protection of historical and cultural monuments**

#### **The concept of monument protection**

Protection of historical and cultural monuments in the conceptual plan is the following:

1. Regular studying of historical and cultural monuments for the definition of their historical value with the purpose of taking special measures for protection.
2. Preservation, restoration of historical and cultural monuments, prevention of destructive influence on them by the destructive actions of nature.

#### **Measures for preservation**

According to the standard classification and certification there are allocated three groups of protected monuments.

1. Especially protected monuments described in great volume of cult, civil constructions, of great value in the historical and cultural attitude. Such kinds of monuments are considered: the ancient settlement of Saraychik, the settlement of Akshi in the area of the modern settlement of Karatau and the ancient settlement of Aktobe near Atyrau, etc. They should be taken under state protection.

2. Average protected group of monuments. The mausoleums, koytasy, kulpasy, the cult constructions representing historical and artistic value, include the following: the necropolises of Dyuseke, Daukara, Kosbatyr, Taylak, etc. The monuments, which are included in this group, should be taken under local protection.

3. Less protected group of monuments. Numerous burial places, less significant civil and cult constructions - necropolises of Uten-Ata, Shomen, Kудaybergen, Mambet, Tegen, etc. – belong to this group.

For the study and preservation of historical and cultural monuments the following is necessary:

1. Discovery, study and scientific certification of monuments of the cultural heritage of the people.
2. An establishment of security boards with summaries, propagation of

knowledge of monuments, sponsorship of monuments by companies, organizations, schools and other educational institutions.

3. Constant supervision by experts, directly during the works in the infrastructural plan.

4. The device of metal fencings from grid “Rabitsa” around the most significant necropolises distinguished by artistic expressiveness and uniqueness - Karachungul, Asaly-Koktay, Ushken-Ata, Kosbatyr, Tegen, Zhangeldy, Bayganby, the Taskran-tower, etc.

5. Carrying out of the restoration works of the most significant objects - the necropolises of Dyuseke, Shardygul, Asaly-Koktay, Daukara, Bali, Kosbatyr, etc.

6. Carrying out rebuilding works on the Tegen, Zhangeldy, Darhanbay, monuments, and others.

### **3.3. Ecological education of the population**

#### **The concept of ecological education**

Preservation of the environment can be provided only if the population has a certain level of interest in the questions of ecology and, also some knowledge of this field.

Ecological education should be permanent and on-going. For this purpose it is necessary to promote nature protection knowledge not only in the family, but also in kindergartens, schools, the after-school children's organizations, technical schools, high schools, work collectives, establishments of a science and culture, the media (the newspaper, magazines, radio, TV), clubs, places of rest of the population, cinema, theatre, and other places.

Propagation of nature protection knowledge should be differentiated, intelligible and various, and of the proper scientific level.

Collectives of the enterprises, establishments, including educational, and also private citizens should be encouraged to take a kind, zealous attitude towards the nature, its restoration and reduction of ecological damage.

Heads and collectives of the enterprises and establishments, and also the separate citizens breaking rules and norms of the careful attitude towards the environment whose actions negatively influence the ecological condition of the air, water, ground, fauna and flora - pollution of nature, non-observance of limits of use, irrational use of natural resources (minerals, water, soils, representatives of wild fauna and flora), etc. - should be exposed to penal sanctions and the description of their harmful actions in mass media, i.e. they should be “named and shamed”.

## **Propagation of nature protection knowledge**

□The Basis of propagation of nature protection knowledge lies in its introduction to the consciousness of people, that natural resources are final, exhaustible, that the first law of ecology says: “Everything is linked with everything” and that’s why any rash intrusion into nature entails negative, and sometimes irreversible, consequences, that the human being should behave in the world as the zealous, economical owner but not as the temporary owner.

It is necessary to quote and promote the statement of one well-known ecologist: “Whoever thinks that the earth and nature has come to us as an inheritance from our fathers is deeply mistaken. No! We borrow all this from our children and grandchildren”.

We cannot, we have no right to leave as the inheritance for future generations nature in a worse condition, than it was when we came into “this fine and furious world”.

Propagation of ecological knowledge should be directed at the education of careful, rational, resource saving use of nature by every citizen. Ecological education should be permanent, from childhood, from school and other educational institutions, and be continued through adulthood and up to the end of the person’s life.

All media should be involved in of ecological education - newspapers, magazines, broadcasting, TV, cinema, theatre. Public consciousness can be influenced by conducting a uniform ecological policy in the maintenance of contents of textbooks, on any year of study at average special and higher educational institutions, in the edition of leaflets, posters, etc.

### **Recommended actions**

Regularly to take into account, analyze and generalize experience of propagation of nature protection knowledge. This experience needs to be promoted by media, with the mentioning individual people and groups, who attain special achievements in this noble business.

To strengthen the information about the work of regional society of conservancy, societies of hunters and fishermen, the nature protection supervising organizations, but mainly, about the work of all regional, divisions of Management of the ecology and preservation of the environment.

To promote ecology from the site of faculties in higher educational establishments, of the enterprises and organizations of Atyrau.

To practice annual conducting of ecological exhibitions (as on separate sections of nature protection activity, so in complex). To update constantly varying ecological information using wall-stands, leaflets, booklets and posters of the activity of

inspectors of the Regional ecology society, public enthusiasts of conservancy and the experiences of the nature protection work of advanced teams.

To continue and develop the practice of issuing regular ecological information about the condition of the environment and nature protection actions in constant headings in regional and local media (newspapers, broadcasting, TV), speeches by experts, scientists and public figures on ecological themes.

Constantly to show in mass media the activity of inspectors and experts of the Regional ecology society, Water police, supervising bodies and public organizations in business of conservancy. In particular to pay attention to questions of strengthening the struggle against poaching and other infringements of the nature protection legislation, to show the results of complex spot-checks - checks of the condition of water and ground resources, the control over emissions and dumping of polluting substances, and the condition of plants and animals of area. To continue practice of monthly informing of the population about ecological conditions in the area by means of publication of "the Ecological bulletin" in regional newspapers, and on regional radio and TV.

To continue and expand measures for carrying out ecological education, beginning with kindergartens, schools, and technical training colleges, and also technical schools, high schools. This business is moved ahead by the organization of a series of lectures and talks by of experts - ecologists, leading public expeditions, campaigns and walks to the nature, creation of ecological circles, clubs with interests in floriculture, dogs, cats, hunting, fishery, etc.).

To strengthen the promotion of ecological knowledge among heads and technical officers of enterprises and establishments by means of reading lectures and conducting excursions to nature protection objects.

To pay special attention in education to the effective love of nature of rising generation by activation of "Blue patrols", "Green patrols", at forestry enterprises - school forest areas, children's and youthful expeditions to native territory, the organization of meetings with experts - ecologists, the edition of posters, leaflets, booklets, demonstration on TV of amateur films, and also the organization of "nature tables" in kindergartens, schools and other educational and other establishments.

To again public support for the activity of experts and scientific high schools, scientific organizations, ecological bodies in business of protection of nature sanctuaries, historical and architectural monuments.

To practice regular demonstration of professional and amateur films and video films on the theme of nature defence on TV, at cinemas, clubs, palaces and houses of culture, and also in work collectives, at schools and other educational establishments.

Under the slogan "Multiply, defend and know nature " the organization of annual bird months, gardening weeks, forest and nature days, operations "Living Silver", holidays for colours, months of gardening, sanitary clearing and accomplishment of settlements, "clear Fridays", etc.

Organization of competitions of the best poster, the best publicist material (a story, a sketch), the best action on nature protection subjects, propagation of ecological knowledge, education of the careful and highly moral attitude towards plants and animals, ground, water resources and minerals, to increase ecological culture and knowledge in this area.

To increase and the active role of cultural and educational establishments in nature protection education of the population. To practice leading in palaces of culture, clubs, libraries conducting of thematic evenings, meetings of fans of nature, round-table discussions, reader's conferences, performances of propaganda teams on nature protection subjects and other mass actions.

To strengthen work over the organization of competitions on themes of nature defence. To plan months for promotion of the ecological knowledge, the nature defence dated for the World day (on June, 5) and to the World day of children (on June, 1): competitions for children's picture, competitions for the best ecological poster and a leaflet, competition on the best publication: a cycle of programs and separate materials on broadcasting and telecasts, articles in newspapers, magazines, brochures and books, competition of flower growers, cactus fans, fans of arts like "bonsai" and ichibana (arrangement of bouquets and vegetative compositions), etc., etc.

To plan annual competitions for the best statement for the promotion of nature protection knowledge and ecological education of citizens at the enterprises of the area, at schools, in colleges, high schools.

To organize ecological seminars for tutors of kindergartens and teachers of schools by groups of scientists and experts of local establishments and high schools.

To organize and support constant headings on a regional theme: "The Ural - the reserved river", "Problems of reserved water area of the Northeast Caspian sea", "Defend and study the native nature", "Rational defence of nature", etc.

Conducting the explanatory work about the introduction of specifications of a payment:

for natural resources (specifications should stimulate rational and complex use of the ground, water, a wood, minerals and other resources);

for emissions of polluting substances in the natural environment (specifications take into account the expenses necessary for prevention and liquidation of pollution, studying of their structures and properties), and a source of payments under this specification is the profit (income) of the enterprise;

for excess of allowable emissions and dumps of polluting substances in the natural environment and emergency pollution - in the multiple size in relation to the specification.

Activation of work on health education and formation of the healthy way of life of the population, propagation of a balanced diet and preventive maintenance of diseases, eradication of smoking, drunkenness, a drug-addiction and other unhealthy

habits, wide coverage by radio, TV, in newspapers and cinema the experience of preventive and improving actions in separate collectives, settlements. The organization of TV and radio programs on questions of formation of a healthy way of life.

### **3.4. About the basic directions of ecological scientific researches**

Scientific maintenance of wildlife management and improvement of ecological conditions on the territory of Atyrau area should be based on the results of fundamental and applied researches which are carried out within the framework of republican and regional ecological programs, and also the branch research organizations, industrial enterprises, establishments, etc.

For studying laws of processes taking place in the natural environment today, and also for acceptance of measures for the improvement of Atyrau environment research should be further conducted in the following directions:

Development of the theoretical and methodical base of the general ecologization thinking and consciousness, ethics, culture, distribution of ecological knowledge.

Development and working out of the ecological social and economic theory of balanced inexhaustible wildlife management, scientific bases of preservation of biological variety.

Development of information supply of environment condition and natural resources use methodological bases.

Development of the natural environment modern condition and population health estimation methods, regional ecological capacity, ecological risk while working out concepts and basic directions of productive forces accommodation estimation methods.

Creation of complex and authentic inventory of the natural resource potential system, operative tracking of its dynamics with space and computer means application, remote systems of automatic transfer and ecological information processing.

Development of scientifically proved concepts, forecasts and development programs of industrial production in Atyrau area under the given limited conditions of ecological equilibrium maintenance of flora and fauna preservation and development.

Regular carrying out of the account (inventory) of pollution and certification of emissions and dumps sources, establishment of maximum permissible emissions and dumps specifications, perfection of a payment system for natural environment pollution.

Development of principles and cadastres conducting methods of natural hygienic systems components, methods and means of local, regional and background monitoring.

Development of risk forecasts of the general diseases caused by pollution of the

natural environment for the definition of priority preventive actions.

Researches on problems of restoration and stabilization of ecological systems in the pool of the Caspian Sea in connection with its level rise, and also on system of protective measures of economic objects in connection with the sea coastal areas flooding.

Applied ecological researches, which should be executed within the next ten years:

Working out of development circuits and objects accommodation of natural reserved fund of Atyrau area.

Development of complex interbranch programs "Ecology" on protection and improvement of ecological conditions in Atyrau and the areas of Zhylyoysk, Makat, Kurmangazy, Isatay, Makhambet and Inderskom.

The map "Wildlife management of Atyrau area in scale 1:500000" drawing up and edition.

Development and introduction of calculated specifications and payment for thermal emissions industrial enterprises.

Development and introduction of portable clearing devices for additional cleaning water of sources of drinking water supply with use of products from PGS-POLYMERS.

The estimation of possible territory flooding with freshet and pileup waters of the river Ural outfall areas with the purpose of negative ecological consequences reduction in connection with increase of the Caspian sea level.

Development of computer programs on wildlife management and examinations of nature protection works projects issues.

Creation of constantly updated ecological area and district maps and also maps of flora and fauna.

Development of rigid ecological restrictions on territories, ecosystems for development and accommodation of productive forces.

Perfection of management economic mechanism by preservation of the environment in conditions of separate area territories transition to market economy.

Degradation degree estimation of the separate territories natural environment of Atyrau area and development of measures on their improvement.

Studying laws of display and development of measures on struggle with eutrophicating waters of the river Ural and other water objects of the area.

Natural components of the area environment database creation.

Creation of natural resources cadastres and estimation of level influence of their extraction on the environment.

Ecological condition estimation and ground growth class calculation of Atyrau, Kulsara and other objects.

Ecological condition examination and substantiation of monitoring supervision stations on the territory of Atyrau area.

## LITERATURE

Agess P. Keys to Ecology. - L.: Hydrometeoizdat, 1982.

AGRA (Earth and Environmental Limited - AGRA). The Tentative Estimation of Influence on Environment (PredEIE programs of prospecting drilling in the northeastern part of the Caspian Sea). - Calgary (Canada), 1996.

ADL ("Arthur D.Little Inc."). The Estimation of Influence on the Environment (EIE). Seismic works. The report for joint-stock company "KazakhstanCaspianShelf", part I. - Cambridge, Massachusetts, USA, 1994.

Ajbasov E.Z., Mulikov R.R., Zheksenov M.K., The Way of Water Treating of Radioactive Isotopes. The patent № 970829 dated 29.09.97.

Ajtaliev S.M., Diarov M.D., Kudajkulov A.K., Drizo E.A., The Influence of the Open Fountain Pore 37 (Tengiz) on the Environment, Modelling of Influence on Environment in Case of Assumption of a Similar Open Fountain on Kashagan Structure. The final report on theme KhD 03/96 dated 10.04.1996. Funds of Joint Stock Company "Atyrau-Vylym" and Joint-stock Company "KazakhstanCaspianShelf" - Atyrau, Almaty, 1997. - 235 pp.

Alibayev G.S., Atmosphere Pollution Hygienic Estimation Sources in Industrial City. //Scientific Theor. Conf. On Environment Preservation Reports Theses. - Perm, 1977. – pp. 57-59.

Aliev R.M, Use of Microorganisms in Development of Biotechnological Methods of Oil Pollution Clearing. The Report of the Scientific Practic Seminar "Effective Techniques and Technology of Investigation, Extraction, Processing of Hydrocarbonic Raw Material and Use of Waste Products" (Atyrau, 23-25.06.92), Atyrau, 1992

Aytaliyev Sh.M., Regional Aspects of the Kazakhstan Science: Genetic Feature, Industrial Necessity, Economic Stimulation, Administrative Duality. //Materials of the Republican Meeting "Problems and Ways of Scientific Technological Development of the Republic of Kazakhstan" (Almaty, May 1996). - Almaty, KazgosINTI, 1996. - pp.184-189.

Aksenov I.J., Aksenov V.I., Transport and Preservation of the Environment. M., Transport, 1986, 176 pp.

Aldabergenov N.K. About Methodology of Construction of the Maintenance of Ecological Education of the Future teacher.//Reports Theses of Region. Scientific Technical Conf. "Problems of Ecology of the Western Kazakhstan and Waste Products Recycling" (Atyrau, February 1996). - Atyrau, 1996 - pp. 29-30.

Aldabergenov N.K., Systematization in Ecological Education of University Students. //Reports Theses of Scientific Technical Conf." Problems of Ecology of the Western Kazakhstan and Waste Products Recycling" (Atyrau, February 1996). - Atyrau, 1996. - pp. 30-31

Aldabergenov N.K. On the Contents of Ecology Rate in Atyrau University. //Reports These of

Region. Scientific Technical Conf." Problems of Ecology of the Western Kazakhstan and Waste Products Recycling" (Atyrau, February 1996). - Atyrau, 1996. - pp. 31-32

Aliev R.M., Bolshov A.A., Diarov M.D., Gilazhov E.G., etc. The National Report of the Republic of Kazakhstan. Condition of Biodiversity in the Kazakhstan Part of the Caspian Sea. - Global Ecological Fund. The United Nations Development Program. Atyrau, 2000, pp. 11-17.

The Kazakh SSR Atlas, part 1. Environment. Scale 1 : 7500000. - M., 1982.

BakhytzhanoV Ye.N., etc. The Report on SRW "Studying of Background Pollution of Atmospheric Air and Radiation on the Territory of Joint-Stock Company Tengizmunaygas Activity" 1995 – Kulsary settlement, CSRL Joint-Stock Company TMG, 1996. - 48 pp.

Bajdin S.S., Kosarev A.N. (ed.). The Caspian Sea: a Hydrology and Hydrochemistry. M., the Science, 1986, 261 pp.

Bekkaliyev S.H., Gilazhov E.G., Alpatanov S.S., Amirkhanova M.M., Zhanbatyrov O., Social Economic Conditions and Environment of the Kazakhstan Part of the near Caspian Region (in KEP frameworks). - Global Ecological Fund. The Program of the United Nations Development. The Caspian Ecological program. Kokshetau, 2000.

Belov V.P., Phillips J.G. Basic Features of Water Circulation in the Northern Caspian sea. // GOIN Works - issue 168. - M., 1986. - pp. 49-52.

Belov S.V., Barbinov F.A., Kozjakov A.F., etc. Preservation of the Environment. - M.: Vysshaya Shkola, 1991. - 320 pp.

Belov P.S., Golubeva I.A., Nizova S.A., Ecology of Chemical Products Manufacture out of Hydrocarbons of Oil and Gas. M.: Chemistry, 1991. - 256 pp.

Belgimbayev M.E., Storm Dusty and Questions of Deflided Soils Classification // the Commission Symposium "the Person and Environment" XXIII International Geographical Congress. - M., 1976. – pp. 210-215

Belgimbayev M.E., Soil Monitoring and Protection// Methods of Deflation Studying and Soil Protection - Alma-Ata: Kaynar, 1986. – pp. 11-12.

Beljaeva V.N., Kazancheev E.N., Raspopov V.M., etc. The Caspian Sea. Ichthyofauna and Trade Resources. - M.: the Science, 1989. - 236 pp.

Bespamjatnov G.P., Bogushevskaja K.K., Bespamjatnova A.V., Krotov J.A., Maximum Permissible Concentrations of Harmful Substances in Air and Water. 2-nd issue - L.: Chemistry, 1975. - 456 pp.

Bizhanov N.K. On Modern Condition of the Caspian Sea// Materials of the Gen. Meetings on a Problem of the Caspian Sea (Guryev, June 1991). - Guryev, 1991. - pp. 13-18.

Bogdanov A.J., Flora and Fauna of the Northern and Western Kazakhstan. Prospects of Use. // Materials of Exit Session Reports of the Scientific Council“ Flora of Kazakhstan, Rational Use of its

Resources in a National Economy and Protection” Kaz.SSR SA (Uralsk, Oct. 15-17, 1985). – A-A, 1987. - pp. 38-42.

Bogdanova K.N., Bojko E.V., Petrov J.M., On the Animal Plankton Role in Clarification of Sea Water off Mineral Oil. //taken from the book Problems of Water Toxicology”, part II. - Petrozavodsk, 1975. - pp. 162-164.

Bolshov A.A., Oil Recovery Influence on the Ecological Condition of the Northern Caspian Sea Shelf. // Theses of the III Rep. Scientific Technical Conferences Reports “Scientific and Technical Progress and Ecology of the Western Kazakhstan” (Atyrau, September, 1994). - Atyrau, 1994. - pp. 100-101.

Bolshov A.A., Supply of a Mineral Phytoplankton Feed in Delta and on a Beach of the Ural as a Basis of a Forage Fish Reserves. //In Col.“Sturgeon Stocks Formation in Conditions of Water Resources Complex Use”. Theses of Gen. Meeting Reports (Astrakhan, October 1986). - Astrakhan: ed. CSRR, 1986. - pp. 38-40.

Borisenkov E.P., Communication of Fluctuations of the Caspian Sea Level with Climatic Change. // Materials of Gen. Meetings on the Caspian Sea Problem (Guryev, June 1991). - Guryev: ed. Kazhydromet, 1991. – pp. 18.

Bortnik V.N., Nikonova R.E., Long-Term Variability of the Caspian Sea Average Level. // Theses of the Gen. Rus. Conf. “The Russian Sea Ecosystems in Conditions of Anthropogenous Press (including a craft)” (Astrakhan, September 1994). - Astrakhan, 1994. – pp. 62-64.

Bukharitsyn P.I., Condition of Water Pollution of the Northern Caspian. // Materials of Gen. Rus. Meetings on the Caspian Sea Problems (Guryev, June 1991). - Guryev, 1991. – pp. 59-62.

Bykov B.A. To a Question of Vegetation Integrated Approach in Near Caspian Region. // Collection: Questions of a Forage Reserve Improvement. - M. - L., 1954.

Bykov B.A., Vegetation and Fodder Resources of the Western Kazakhstan. - Alma-Ata, 1955.

Bykov B.A., Basic Ecosystem Deserts of Central Asia and Kazakhstan. // Problems of Deserts Development, 1981, № 4. - pp. 18-39.

Veselov E.A., Influence of polluted with oil water on fish. // Magazine “Fish facilities”, № 12, 1948. - pp. 21-22.

Vikulov J.G., Ecological Condition in Atyrau Area and Measures on its Improvement (Report at the Session of Regional Atyrau Council of People's Deputies)- Atyrau, October 1993 - 86 pp.

Vikulov J.G., Environmental Problem of Atyrau Area Demanding the Prime Decision. // Reference Materials on Atyrau Area in Frameworks of the “National Action Plan on Preservation of Environment for Steady Development of the Republic of Kazakhstan”. - Atyrau, 1996.

Vinogradov L.G., Long-Term Change of the Northern Caspian Benthos. // ISRD Works, part 38, issue. 1. - 1959. - pp. 241-276.

Vladimirov A.M., Ljakhin J.I., Matveyev L.T., Orlov V.G., Environment Preservation. - L., Hydrometeo Edition, 1991. - pp. 424.

Water Code of RK. № 2062-XII. - Almaty, March, 31<sup>st</sup>, 1993

Volchegurskij L.F., Babanova A.M., Alyeshina G.E., Petrova N.V., etc. Scientific Report of Spaceaerogeology Expedition № 1 of Scientific Manufacturing Enterprises "Aerogeology" on the subject "Zone Studying of High Technogenic Loadings of Atyrau Area of the Republic of Kazakhstan" - Moscow, 1993. - 90 pp.

Time Damage Design Procedure while Polluting Atmosphere, Ground and Water Resources with Mineral Oil, Tabular Waters and Accommodating Non-Authorized Oil Barns. - Almaty: ed. Of MinEcoBioResources, 1996. - pp. 48.

The Temporary Order of Sanctions Delivery to Wildlife Management. - Almaty: the Ministry of Ecology and Bioresources of the Republic of Kazakhstan. - Almaty, 1993.

Vukhrer V.V., New Land in Desert Vegetation Formation. The Dissertation on Getting the Scientific Degree of Cand.Biol.Sci. - Alma-Ata, 1990.

**Gilazhov E. The Perspectives of Oil Industry Development in Kazakhstan. – I-st International Symposium. The European Union and Caspian Sea Region in Dialogue. - 11-13 March 2002, Berlin**

**Gilazhov E. Enviromental Protection-Problems of the Kazakh Part of the Caspian Sea. - In the same place**

Gavrilova I.P., Landscape Geochemical Mapping. - M.: ed. The Moscow State University, 1985. - 148 pp.

Gavrilov E.I., Seasonal Migration of Birds on the Territory of Kazakhstan. Alma-Ata: ed. KazSSR SA, 1979. - 252 pp.

Geobotanical Map of Kazakhstan (M 1 : 500000). - Almaty: KID KazGiprozem, 1993.

Gershtanskiy N.D., Run-down and Run-up Change of Level and Flooding of Coast in the Eastern Part of the Northern Caspian sea. // Materials of Gen. Meetings on a Problem of the Caspian Sea (June, 1991). - Guryev, 1991. – pp. 77-79.

Giljarov M.S. (head ed.) the Biological Encyclopaedic Dictionary. - M.: the Soviet Encyclopedia, 1986. - 831 pp.

Geochemical Researches and Bowels Protection. - M.: VIEMS MGP "Geoinfomark". issue. 1, 3, 1991. - 79 pp., 48 pp.

Gilazhov E.G., Some Statistical Data on the Caspian Sea Level Flactuations - The International Seminar «Ecology of the Caspian sea: Northern Pool». June, 26-29 2002, Atyrau

Gilazhov E.G., Ecological Condition of Tajsojgan Range. - Publishing House AINiG MONRK. Atyrau, 2002., 89 pp.

Gilazhov E.G., Diarov M.D., On the Condition of Soil Pollution in Atyrau, Kurmangazy areas. - Materials of the 1st International Scientific Technical Conference «Modern Problems of Processing and Use of Hydrocarbonic Raw Material of Kazakhstan» December, 18-19 2000, Atyrau, 1<sup>st</sup> part, page 460-468.

Gilazhov E.G., Diarov M.D., Jarmagambetov T.R., Influence of Anthropogenous Influence on Flora of Atyrau Area. - Theses of Scientific Practical Conf. Reports "Prospects of Opening, Extraction and Transportation of Atyrau Area Oil and Gas", Atyrau, 1998

Gilazhov E.G., Diarov M.D., Diarova M.A., Gumarov S.S., Ecological Restriction in Wildlife Management of Arid Zones. - Materials of International Scientific Technical Conference on the " Problem of Oil-and-Gas Complex of Kazakhstan» December, 5-6 2001, Atyrau, page 285-287.

Gilazhov E.G., Sulejmenova Z.U., Gilazhova G.E., Diarov M.D., Characteristics of Industrial and Economic Waste Products of the Makatskiy Area. - Materials of the 1st International Scientific Technical Conference «Modern Problems of Processing and Use of Hydrocarbonic Raw Material of Kazakhstan» December, 18-19 2000, Atyrau, part 2, page 384-387.

Gilazhov E.G., Sulejmenova Z.U., Gilazhova G.E., Diarov M.D., Social and Ecological Negative Consequences in Connection with the Rise of the Caspian Sea Level in the Isatay area -pp. 388-393.

Glazovskaya M.A., Applied and General base of the Landscape Geochemical Division into Districts. // Questions of Geography. Collection 120. Landscape Geochemical Division into Districts and Environment Protection - M.: Idea, 1983.

Golubov B.N., Ecological Consequences of Abnormal Rise of the Caspian Sea Level in Connection with a Mode of Operation Bowels. // the "Caspian Sea - Present and Future ". Theses of International Conf. Report (Astrakhan, November 1995). - Astrakhan, 1995. - pp. 69-70.

Grishchenko O.M., Diarova R.A., Didichin N.A., etc. Drawing up and Preparation for the Map Edition Wildlife Management of Atyrau area of scale 1:500000". The Scientific Report. Funds of Western Branch NAN RK and Ecology Management and Bioresources of Atyrau area. - Atyrau, 1996. - 128 pp.

Grishchenko O.M., Biogeochemical Anomaly of Petroliferous Structures in Arid Zone. Bulletin of SA of KazSSR, № 1, 1983.

Grishchenko O.M., Ecological Systems Feature of Petroliferous Structures in Arid Zone. Geology and Investigation, № 5, 1985.

Grishchenko O.M., Prospect of Landscape Indication of Oil-and-Gas Content of the Near Caspian Hollows. - Atyrau: CSRI, 1992, 21 pp.

Grishchenko O.M., Bayzakov M.K., Criteria of Landscape Indication of Oil-and-Gas Content of the

Near Caspian Hollows. // Power and Fuel Resources of Kazakhstan, 1994, № 2, pp. 56-64.

Darevskij I.S., Oreks N.D., Rare and Disappearing Animal (Amphibious and Kowtowing). - M.: the Higher school, 1988. - 463 pp.

Dzhangirjants D.A., Diarov M.D., Karamurziyev T.K., Drizo E.A., Sakhipov N.G., Water Mineral of Atyrau Area and Methods for Their Rational Use. Inform. Leaf of Atyrau CSRI № 87-93. - Atyrau, 1993. - 6 pp.

Jarmagambetov T.Z., Vegetation of the Near Caspian Lowland (within the limits of the Guryev area) // Flora and Vegetation of Northern and Western Kazakhstan. Prospects of Use. Reports Materials of Exit Session of Scientific Council "Flora of Kazakhstan, rational use of its Resources in the National Economy and Conservation" (Uralsk, Oct.,15-17, 1985). - Alma-Ata: SA KazSSR, 1987. - pp. 47-54.

Diarov M.D., Alpatanov S.S., Gilazhov E.G., Coastal Zone of the Kazakhstan part of the Caspian Sea. - Materials of the 1st International Scientific Technical Conference «Modern Problems of Processing and Use of Hydrocarbonic Raw Material of Kazakhstan» December, 18-19 2000, Atyrau, page 460-468.

Diarov M.D., Gilazhov E.G., etc. The Coastal Zone of the Kazakhstan Part of the Caspian Sea. - Global Ecological fund. The United Nations Development Programme. Atyrau, 2000

Diarov M.D., Gilazhov E.G., etc. The Condition of Air Pool and Health of Atyrau Area Population. - Fund of the Open Company "Tengizshevroil" and fund AIRNTP. - Atyrau, 2001.

Diarov M.D., Diarova M.A., Gilazhov E.G., Condition and Dynamics of Atyrau Area Population Disease. - Materials of the International Scientific Technical Conference on the "Problem of an Oil-and-Gas Complex of Kazakhstan» December, 5-6 2001, Atyrau, page 285-287.

Diarov M.D., Drizo E.A., Bolshov A.A., Kamelov A.K., Aminova I.M., etc. Studying of Influence of a Sea Level Raising and Run-up Phenomena on Pollution and Ecology of the Shoalinesses Adjoining to Some Petrocrafts at the Northeast Caspian Sea Coast. The Final Report on Works 1994-1995. Funds of ZapO NAN RK and State Companies "KazakhstanCaspianShelf". - Atyrau, Almaty, 1995. - 131 pp.

Diarov M.D., Drizo E.A., Kurochkina L.J., Shabanova L.V., Bolshov A.A., Samarin E.G., etc. The Scientific Report "Studying of Flora and Fauna in a Zone of Joint Venture "Tengizshevroil" Activity", part 1. - Funds of NAN RK Western Branch, Institute of Botany of PK SA and Joint Venture TSHO. - Atyrau, 1994. - 365 pp.

Diarov M.D., Drizo E.A., Complex Interbranch Program "Ecology" on Wildlife Management and Improvement of Ecological Conditions on the Territory of Atyrau area for 1996-2000 and on Prospect till 2005 - Atyrau: Funds ZapO MN-AN RK and Managements of Ecology and Bioresources of Atyrau Area, 1996.-203 pp.

Divakov I.B., On Estimation of Coastal Areas Flooding of the Northeast Caspian Sea at Rising the Sea Level. Tr. GOIN, issue. 183. - M.:Hydrometeoizdat, 1991. - pp. 37-41.

Dimeyeva L.A. To the Protection of the Northern Near Caspian Region Vegetation // Magazine "Problem of Deserts Development", 1990. – pp. 70-73.

Didichin N.A., Grishchenko O.M., Bayzakov M.K., Resource of Underground waters of Atyrau Area. 2. Fresh waters of Alluvial-Deltoid Adjournment. - Atyrau: CSRI, 1994. - 6 pp.

Didichin N.A., Grishchenko O.M., Diarov M.D., Resource of Underground Waters of Atyrau Area. 3. Fresh and Slightly-Mineralized Waters of Alb-Cenomanian Adjournment. - Atyrau: CSRI, 1995. - 4 pp.

Dodin D.A., Sadikova M.A., Tarkovitskiy L.P. From the Col. "Ecological Geochemical Researches in Intensive Technogenic Influences". - M., 1990. - pp. 81-82.

Drizo E.A. Calculation of Some Dynamics Characteristics of Animal Population, in particular Stellate Sturgeon in the Northern Caspian Sea. Inform. Leaf of Atyrau CSRI № 70-93. - Atyrau, 1993.

Drizo E.A. Increase of the Caspian Sea Level, Wind Run-ups and their Ecological Consequences.// Theses of Region. Scientific Technical Conf. Reports "Ecological Problems of the Western Kazakhstan and Waste Products Recycling" (Atyrau, February 1996). - Atyrau, 1996 - pp. 10-13.

Drizo E.A., Diarov M.D., Bolshov A.A., Oil Pollution of the Eastern Part of the Northern Caspian Sea and its Possible Consequences. // Theses of the 3d Republic Scientific Technical Conferences "Scientific and Technical Progress and Ecology of the Western Kazakhstan" (Atyrau, September 1994). - Atyrau, 1994. - pp. 14-15.

Drizo E.A., Diarov M.D., Bolshov A.A., Oil Pollution of the East Part of the Northern Caspian Sea and its Possible Consequences. - Information Leaflet № 34-96 of Atyrau CSRI. - Atyrau, 1996.

Drizo E.A., Diarov M.D., Bolshov A.A., Abdiyev Z.R., Oil Pollution of the Northeast Caspian Sea Water Area and Its Possible Consequences. //Theses of Region. Scientific Technical Conf. Reports "Ecological Problems of the Western Kazakhstan and Waste Products Recycling" (Atyrau, February 1996) - Atyrau, 1996. - pp. 6-9.

Egorov I.G., Bukharitsyn P.I., Hydrosulphuric Infection of the Northern Caspian Soil// Theses of the Gen. Russ. Conf. "The Sea Ekosystems of Russia in Conditions of Anthropogenous Press (including a craft)" (Astrakhan, September 1994). - Astrakhan, 1994. – pp. 47-48.

Esenov S.E., Kunaev D.S., Mukhamedzhanov S.M., Bowels of Kazakhstan. - Alma-Ata: Kazakhstan, 1968. - pp. 127.

Zhivoglyad A.F., Vegetation Change of the Volga Deltas Lowers in Connection with the Increase of the Caspian Sea Level // "the Caspian Sea - Present and Future", Theses of the Intern. Conferences Reports (Astrakhan, November 1995). - Astrakhan, 1995. - pp. 77-78.

Law "On Preservation of the Environment". - Almaty, 15.07.1997

Law “On Especially Protected Natural Territories”, № 162-1 RKL. - Almaty, 15.07.1997

The Republic of Kazakhstan Law “On Extreme Situations of Natural and Technogenic Character” - Almaty, July, 5 1996

The Republic of Kazakhstan Law “On Protection of Atmospheric Air” - Alma-Ata.

The Republic of Kazakhstan Law “On Protection of the Surrounding Natural Environment”. - Alma-Ata, 18.06.1991

The Republic of Kazakhstan Law “On Fauna Protection, Reproduction and Use” № 2463-CHTSI. - Almaty, October, 21 1993

The Republic of Kazakhstan Law “On health protection of the Republic of Kazakhstan People”, January, 10, 1993, Additions and Changes of this Law under the Decree of the RK President, November, 29 1995 - Almaty.

Zotov V.A., Davidovich G.T., Scientific Report on the Subject “Drawing up of Geological Ecological Map of the Atyrau Area”. Joint Stock Company "Bowels", State Holding Company "Zertteu". - Aktyubinsk, 1996

Kazakhstani Disappearing Rare Animals and Birds of Kazakhstan, Measures on their Protection and Reproduction. (Alma-Ata, 1977). SA of KazSSR - Alma-Ata: ed. SA of KazSSR, 1977. - pp. 209-215.

Caspian sea. Geology and Oil-and-Gas Content-M.: the Science, 1987. - 295 pp.

The Caspian Sea. Fauna and Biological Productivity-M.: Science, 1985. - 376 pp.

Kasymov R.Y., Environmental Problem of the Caspian Sea. // First International Conference the Caspian Sea Problems. - Baku: ed. "Elm", 1991. - pp. 45-47.

Katunin D.N., Kosarev A.N., Salinit and Biogenic Substances in the Northern Caspian Sea. //“Water resources” Magazine, № 1, 1981. - pp. 77-88.

Kenzhegaliyev A., Bozakhayeva Z., Khobdabergenova G., Condition of the Caspian Sea Northeast Part. // Theses of Region. Scientific Technical Conf. Reports “Ecological Problems of the Western Kazakhstan and Waste Products Recycling” (Atyrau, February 1996). - Atyrau, 1996. - pp. 5-6.

Klige R.K., Modern Methods of the Forecast of the Caspian Sea Level. // ”The Caspian sea - Present and Future”. Theses of the Intern. Conf. Reports. (Astrakhan, November 1995). - Astrakhan, 1995. - pp. 23-24.

Kovda V.A., Biochemistry of a Soil Cover. - M., 1985.

The Republic of Kazakhstan Code on Bowels and Processing of Mineral Raw Material. Almaty, May, 30, 1992, № 1367a-XII

Kolosov A.M., Notes on Fauna of a Mammal Lower Reaches of Emba. // MOIP Bulletin, biologist. section, part. 64, issue. 7-8. - M., 1935.

RNPITS "Kazecology" Staff. The Final Scientific Report on a Subject "Studying of Hydrological Conditions of East Part of Northern Caspian Sea (switching outfall area of the Ural) and a Tentative Estimation of the Influence of the Caspian Sea Level on the Economic Complex of the Region" (Rep. Scientific Man. and Inform. Center "Kazecology", Almaty). Funds of Guryev Region Branch of RNPI Center "Kazecology". - Guryev, 1992.

Konstantinov A.S., General Hydrobiology. - M.: Higher School, 1972. - 472 pp.

The Ecological Safety of the Republic of Kazakhstan Concept. - Almaty, 1996.

Kosarev A.N., Hydrology of the Caspian and Aral Seas. - M.:ed. of the Moscow State University, 1975. - 272 pp.

Kotrekhov E.P., Shaytanov B.N., Dynamics' Studying of the Coastal Line of the Northern Caspian Sea on the Basis of the Space Information. // Materials of the Gen. Russian Meetings on the Caspian Sea Problems (Guryev, June 1991). - Guryev: ed. Kazhydromet, 1991. - pp. 71.

The KazSSR Red Book, part. 1. Vertebrate Animals/under ed. of L.A.Sludskiy. - Alma-Ata: Kaynar, 1978. - pp. 205.

The KazSSR Red Book, part. 2. Plants/under ed. of B.A.Bykov. - Alma-Ata: Science, 1981. - pp. 260.

The USSR Red Book. Kinds of Rare and Taking Place under Threat of Disappearance Animals and Plants, part. I. - M.: the Wood Industry, 1984.

The KazSSR Red Book. Kinds of Rare and Taking Place under Threat of Disappearance Animals and Plants, part I. Vertebrate Animals. - Alma-Ata: Kaynar, 1978.

Krasnozhon G.F., Cartographical Monitoring of the Volga, Ural and Coastal Zone of Northern Caspian Sea of the Outfall Areas at Fluctuation of the Caspian Sea Water Level // Materials of the Gen. Russian Meetings on the Caspian Sea Problems (Guryev, June 1991). - Guryev: ed. Kazhydromet, 1991. - pp. 84-85.

Kuzmichyeva V.I., Ecology of the Basic Zooplankton Caspian Sea Kinds. //Fish Household Researches of the Plankton. Part 2. Caspian sea. - M., 1991. - pp. 129-146.

Kurochkina L.J., Shabanova L.V., etc. The Report on the Subject "Estimation of the Condition and Creation of the Monitoring System at the Basic Types of the Arid Pastures of the Ryn-sand of the Atyrau Area " (1993-1994). Branch of the Scientific Research Institute "Forages and Pastures" Agriculture Academy and Institute of Botany of the RK SA. Funds of Ecology and Bioresources Management of the Atyrau Area. - Atyrau, 1994.

Kurochkina L.J., Shabanova L.V., etc. The Final Scientific Report (1993-1994) on the subject "The Ecological Condition of Natural Systems of the Volga-Ural Sand of the Atyrau Area". Institute of

- Botany of the RK SA. Funds of Ecology and Bioresources Management of Atyrau Region - Atyrau, 1995. - 130 pp.
- Kurochkina L.J., Osmanova L.T., Pasture of Sandy Deserts of Kazakhstan. - Alma-Ata: Kaynar, 1973. - 204 pp.
- Kurochkina L.J., Osmanova L.T., Karibayeva K.N., Fodder Plants of Kazakhstani Deserts. - Alma-Ata: Kaynar, 1986.
- Kurochkina L.J., etc. The Scientific Report "Anthropogenous Influence on Ground, Vegetation, Fauna of the Northeast Part of the Near Caspian Region in Connection with Development of Oil and Gas Extraction Industry". Institute of Botany of the RK SA. - Alma-Ata, 1989. - 200 pp.
- Kurochkina L.J., Smetana N.G., Makulbekova G.B., Dimeyeva L.A., Ecological Conditions in the Oil Near Caspian Region. // The Collection of Theses of the Scientific Practical Conferences "Ecological Economic Problems of Wildlife Management in Kazakhstan". - A-Ata, 1990.
- Kurochkina L.J., Smetana N.G., Makulbekova G.B., Shabanova L.V., Stogova L.L., Lysenko V.V., The Arid Ecosystems Condition and Desertification on the Near Caspian Petrocrafts. // Problems of Desert Development, 1994 - pp. 23-31.
- Kurochkina L.J., Makulbekova G.B., Terekhov V.I., To the Technique of Drawing up the Ecological Forecast of Desertification (Turan is taken as the example). // Magazine "Ecology", № 1, 1985. - pp. 10.
- Leontiyev O.K., Problems of the Caspian Sea level and the Caspian Coast Stability. // the Bulletin of the Moscow State University: part 5. Geography. - 1988, № 1. - pp. 14-20.
- Lesnikov L.A., Matveyev R.P., On the Influence Character of the Volga Drain on Zooplankton of the Northern Caspian Sea. // Works of VNIRO, part 38, 1959. - pp. 176-203.
- Lvovich A.I., Protection of Waters off Pollution. - L.: Hydrometeoizdat, 1977. - 168 pp.
- Malinin V.N, Modern Condition of the Caspian Sea Long-term Forecasting. // "The Caspian Sea - Present and Future". Theses of the Intern. Conf. Reports (Astrakhan, November 1995). - Astrakhan, 1995. - pp. 30-31.
- Marti J.J., The Increase of Biological Efficiency of the Caspian Sea and Value of the Ural Area in this Problem. // Theses of Scientific Manuf. Conf. "The Condition of the Raw Materials Sources, Reproduction and Rational Use of Fish Stocks of the Ural Caspian sea" (Guryev, October 1972). - Guryev, 1972. - pp. 65-68.
- Millers B.A., etc. The Estimation of the Shooting Works Influence on the Northern Caspian Sea Natural Environment. // The Scientific Report on the Subject. KazSRRKH. - Almaty, 1996.
- Methodical Instructions on the Ground Pollution of Chemical Substances Danger Degree. - M.: ed. Health Ministry of the USSR, 1987.

Mirzadinov R.A., Changes Dynamics of the Northeast Caspian Sea Coast at Development. // Problems of Desert Development, 1992. - pp. 32-34.

"Mobile". Pool of Northern Caspian Sea: Ecological Condition and Questions of Oil and Gas Development". Prepared "Mobil" Company by Obri D.G., Ivanov V.A. and Glushko M.A., 1993.

Movchan J.I., Mostyyev A.I., Dynamics Analysis of the Caspian Sea Coastal Line in Connection with Tengiz Ecological Monitoring. // Materials of the Gen. Meetings on the Caspian Sea Problem (Guryev, June 1991). - Guryev, 1991. - pp. 51-54.

Mulikov R.R., Vikulov J.G., Nasirov R.N., Electronic Paramagnetic Resonance as a Method of Definition of Oil Resistivity of Horizons and Deposits' Development Control. //Methodical Development. Almaty: Gylym, 1995. pp. 1-4.

Mulikov R.R., Vikulov J.G. Measures on Recovery and Improvement of Nature Protection Works in Atyrau Area. Theses of Scientific and Technical conference JSC "Academy" Reports, Atyrau, 1997. pp. 1-2.

Mulikov R.R., Galtsev V. E., Galtseva E.V., Nasirov R.N: Application of EPR-DOSIMETRY for the Definition of the Radiation Dose Received by Animals on the Ranges Azgir and Taysoygan. Col. "Problems and Prospects of Development of Science and Technics in the Field of Mechanics, Geophysics, Oil, Gas, Power and Chemistry of Kazakhstan". These of Intern. Scientific Technical Conf. Reports, Aktau, 1996. pp. 308-309.

Mulikov R.R., Kuanysheva G.T., Shamarov S.S., Bakhtiarov A.V., Velk O.D., Nasirov R.N., Spectral Displays of the Radioactive Influence on the Ground and Plants of Azgir. // Complex Use of Mineral Raw Material. 1997. № 1. pp. 88-90.

Mulikov R.R., Kuanysheva G.T., Shamarov S.S., Bakhtiarov A.V., Velk O.D., Nasirov R.N., The Radiation Influence on the Element Structure of Taysoigan Soil. Complex Use of Mineral Raw Material. 1996. № 6. pp. 91-92

Mulikov R.R., Shamarov S.S., Velk O.D., Kanysheva T., Nasirov R.N., Microelement Structure of the Near Caspian Oil and its Ecological Value. // Express Information (VNIOENG), sers. Oil-field Business. 1996. № 9. pp. 23-25.

NVPP "Ecoresources". The report on the Subject "Ecological Monitoring of the Sea Environment of a Shallow Part of Water Area of the Northern Caspian Sea Adjoining to the Tengiz Deposit". Funds of NVPP "Ecoresources". - Astrakhan, 1991. - 51 pp.

Nelson-Smith A., Oil and Sea Ecology. - M.: Progress, 1977.

Neruchev V.V., Autumn Duck Flight in Lower Reaches of the Emba. // News of Ornithology. Materials of IV All-Union conference. - M., 1965 - pp. 269-270.

Neruchev V.V., The Near Caspian Deserts' Birds and their Anthropogenous Updatings. // Scientific Notes of Gorkiy Teacher College, ed. 140, series of Biological Sciences. - Gorkiy, 1974. - pp. 66-72.

Nikolskaja N.I., Khrantsov V.N., The Card of Deserts' Vegetation of the Northwest Kazakhstan. //Geobotanical Mapping. - L.: Science, 1984. - pp. 63-75.

Odekov O.A., Durdyev Kh.D., On the Geological Reasons of the Caspian Sea Level Fluctuations. //Materials of All-Union Meetings on the Caspian Sea Problem (Guryev, June 1991). - Guryev, 1991. - pp. 64-65.

Odum J., Ecology. - M.: the World, 1986.

“The Environment for Europe. The Program of Actions on Environment Protection for the Central and East Europe”. The Document Submitted to the Conference at Minister Level in Lucerne (Switzerland), April, 28-30 1993 - pp. 17-18.

Osadchykh V.F., Influence of a Spring High Water Mode on the Northern Caspian Sea Zoobenthos Development. // Hydrobiological Magazine, p.16, ed. 6, 1980. - pp. 17-25.

Otarov G.O., Moldabekov S.M., Mukhitova R., The Account on the Results of Hydro-geological works under the Control over Protection of Underground Waters from an Exhaustion and Pollution on the Territory of the Guryev Area for 1986-1987. - Guryev, 1988.

The Report of the Botany Institute of the RK SA “Development of the Changes Forecasts of Vegetation and Processes of Ground Ecosystem Desertification”, part. 2. - Alma-Ata, 1991. - pp. 780.

**Polonsky V.F., Ostroumova L.P., Moulikov R.R. The Threat of Flooding and the Problem of Protection of the Territories in the Delta of the Ural River in View of the Caspian Sea Rising Level // XXVII San Francisco Congress, August, 10-15, 1997. p.230-236.**

Panin G.N., Divakov I.V., The Northern Caspian Sea Coastal Areas Estimation of Flooding and the Possible Changes in Evaporation Connected with it. //Materials of the All-Union Meetings on the Caspian Sea Problem (Guryev, June 1991). - Guryev: ed. Kazhydromet, 1991. - pp. 72-73.

Pakhomova A.S., Zatuchnaya B.M., Hydrochemistry of the Caspian sea. L., Hydrometeoizdat, 1966, 343 pp.

Podolskiy L.I., Ljashenko I.I., etc. The Report on the Subject “Monitoring of the Atyrau Area Grounds”. The State Research-and-Production Center of Ground Resources and Land Management of the State Committee of the RK on Ground Relations and Land Management. - Almaty, 1996. - 117 pp.

Polonskiy V.F., Gorelits O.V., Ostroumova L.P., Backwater Penetration and Territory Flooding Threat in Deltas of the Volga and Ural in Connection with the Increase of Caspian Sea Level. // ”the Caspian Sea - Present and Future”. Theses the Intern. Conf. Reports. (Astrakhan, November 1995). - Astrakhan, 1995. - pp. 32-34.

Polonskiy V.F., Ostroumova L.P., etc. The Scientific Report on the Subject “Estimation of the Opportunity of the Territory Flooding with Freshet and Run-up Waters in the Outfall Areas of the River Ural with the Purpose of Negative Ecological Consequences Reduction in Connection with

the Increase of the Caspian Sea Level”. - Funds of Management of Ecology and Bioresources of the Atyrau Region - Atyrau, 1995.

Poslavskiy A.N., New Data on Birds Fauna of the Northern Near Caspian region // Materials on Fauna and Ecologies Ground of Kazakhstanian Vertebrates (mammal and birds). Works of Zoology Institute of the KazSSR SA, p. 20. - Alma-Ata: ed. KazSR SR, 1963. - pp. 194-201.

The Decision of KazSSR SM dated 13.07.1978 № 284 “On Inclusion of the Northern Part of the Caspian Sea and Flood-lands of the River Ural into the Reserved Zone”. - Alma-Ata, 1978.

The Decision of the RK Cabinet dated 23.09.1993 № 936 “On Manufacture of Geophysical Researches”. - Almaty, 1993.

The Decision of the RK Cabinet dated March, 3, 1995 № 218 “The List of the Reservoirs Having Special State or Scientific Value”. - Almaty, 1995.

Safety Rules for Oil and Gas Extraction Industry. - M.: Bowels, 1974. – p. 3.6.4.

The Project “National Plan of Action on Preservation of the Steady Environment Development” (NPDOOS and UR). - Almaty, 1996.

Rare animals of Kazakhstan (Materials to the 2nd edition of the Red Book of KazSSR). - Alma-Ata: the Science, 1986.

Manual on the Environment Preservation in a Regional Lay-out. - M.: USSR Publishing House Goskompriroda, 1980.

Rusanov G.M., Coastal Shoals of the Northern Caspian Sea as Habitats of a Waterfowl in Conditions of the Sea Level Rise. // ”The Caspian Sea - Present and Future”. Theses of Intern. Conf. Reports (Astrakhan, November 1995). - Astrakhan, 1995. - oo. 116-118.

Sainov D.I., Dzerzhinskaja I.S., Zayitsev V.F., Technogenic Soils Biological Activity Respiration with Bacterial Preparations. // ”The Caspian sea - Present and Future”. Theses of the Intern. Conf. Reports (Astrakhan, November 1995). - Astrakhan, 1995. - pp. 125-126.

System of Ecological and Nature Resource Monitoring of the Territory of Kazakhstan, part. 1. - Alma-Ata: RK SA, 1992.

Scriptunov N.A., Hydrological Morphological Processes of the Northern Caspian Sea Coast in Conditions of the Sea Level Rise. //Materials of All-Union Meetings on the Caspian Sea Problem (Guryev, June 1991). - Guryev: ed. Kazhydromet, 1991. - pp. 22-23.

Scriptunov N.A., To the Calculation of the Maximal Set Downs and Run Ups Fluctuations of the Caspian Sea Level. //GOIN Works, ed. 80. - M.: Hydrometeoizdat, 1967. - pp. 46-61.

The List of Maximum Permissible Concentration and Working Roughly Safe Influence Levels (WRIL) of Polluting Substances in Atmospheric Air of the Occupied Places. - Alma-Ata: ed. Minecobioreources of the RK, 1992. - 79 pp.

Stadnitskiy G.V., Rodionov A.I., Ecology - M.: the Higher school, 1988. - 272 pp.

Telitchenko M.M., Ostroumov S.A., Introduction into the Problems of Biochemical Ecology. - M.: the Science, 1990. - 288 pp.

Terziev F.S., Maksimova M.P., Yablonskaya (ed.) The Project "Seas". Hydrometeorology and Hydrochemistry of the Seas. part 6. The Caspian Sea. issue 2. Hydrochemical Conditions and Oceanologic Formation Bases of Biological Efficiency. – S.Pb.: Hydrometeoizdat, 1996. - 324 pp.

Terziev F.S., Kosarev A.N., Kerimova A.A. (ed.) The Project "Seas". Hydrometeorology and Hydrochemistry of the Seas. part 6. The Caspian Sea. issue. 1. Hydrometeorological Conditions. – S.Pb.: Hydrometeoizdat, 1992. - 360 pp.

Requirements to Geological Ecological Researches and Mapping of Scale 1:1000000 - 1:500000. - M.: VSEGINGEO, 1990. - 41 pp.

The Decree of the RK President (valid as the law) “About Oil”. - Almaty, December, 1995.

The Decree of the RK President (valid as the law) “About the Ground”. - Almaty, December, 22 1995.

The Decree of the RK President (valid as the law) “About Bowels and Land Tenure”. - Almaty, January, 27, 1996.

Faizov K.S., Ground of the Guryev Area. - Alma-Ata, 1970.

Philippov Yu.G. On Modelling of Wind Run-Ups at the Eastern Coast of the Northern Caspian Sea and the Opportunity of the Sea Level Regulation. //Materials of the All-Union. Meetings on the Caspian Sea Problems (Guryev, 1991) - Guryev, 1991. - pp. 41-43.

Frolov A.V., The Problem of the Forecast Long-term Level Mode of the Caspian Sea: Results of the Researches Led within the Framework of the Federal Target Program "Caspian sea" Preparation. // "The Caspian Sea - Present and Future". Theses of the Intern. Conf. Reports (Astrakhan, November 1995), Astrakhan, 1995, pp. 45-46

Khamiev S.H., Mulikov R.R., Mugalimova M., Characteristics of the Naryn Territory. // Theses of Reports of Scientific and Technical Conference JSC "Academy", Atyrau, 1997. pp. 21-22.

Chernomashentsev A.I., To the Question of Sulfur and Sulfur-containing Combinations Influence on Fish Facilities. // “ Environmental Problems of the River Ural and Ways of Their Decision. Part 2. (Theses of the All-Union Interdepartmental Scientific Practical Conf., Guryev, April 1989), Guryev, 1989, pp. 36-37.

Chistjaeva S.P., Shchegoleva N.N., On Researches of Set-downs and Run-ups Fluctuations of a Water Level in the Eastern Part of Northern Caspian Sea. //Materials of the All-Union Meetings on the Caspian Sea Problems. - Guryev, 1991. - pp. 38-39.

Shilo N.A., Fluctuations Nature of the Caspian Sea Level. //Reports of the USSR SA, p. 305, № 2, 1989. - pp. 412-416.

Ecological Economic Estimation of the Tengiz Deposits Ecosystem Ground, vol. 1, 2, 3. - Giprovtokneft-Tengiz-IBF SA of the RK, 1990-1992.

Jakushin L.M., Gudyryn M.P., Panasov B.V., Monitoring Organization of the Persalt Thicknesses Underground Waters. - Oil Facilities, № 2, 1993. - pp. 43-45.

Jakutsenin V.P., Hydrogeology of the Southeast Near Caspian Hollow in Connection with Oil-and-Gas Content - L.: 1961. - 262 pp.

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