CHAPTER 8 PREDICTION AND EVALUATION AND COUNTERMEASURES FOR THE IMPACT

8.1 AIR

At the West Transfer Station, it is planned to unload solid wastes from light-duty trucks, to load manually heavy-duty vehicles and to load treated wastes into refuse tippers. In the process of loading, the solid wastes will be compacted.

During transportation and transferring of wastes, the process of decomposition does not take place.

All waste transfer works at the transfer stations will be done during the working day, and to the end of the day, all wastes should be transferred and must not be left for the night.

There is only one source of spontaneous emissions at the stations. It is the exhaust gas from the internal combustion engines, which is not registered but is considered for the evaluation of total emissions from the stations.

In the process of unloading compacted wastes, dust emissions may not be considered because the humidity of the total volume is 40-50%. Calculations of impact on the air of the adjacent territories show insignificant meaning of the absolute value of pollutant emissions into the atmosphere.

Table 8.1.1 Pollutant Emissions into the Atmosphere at the Candidate Site for West Transfer Station

Pollutants	Volume of emissions	
	g/sec	Tons per year
Carbon oxide	0.1074	4.866
Hydrocarbons	0.0324	1.283
Nitrogen dioxide	0.0432	1.918
Soot	0.0168	0.681
Sulfur dioxide	0.0222	0.879
Benzapilene	0.33×10^{-6}	9.52×10^{-6}
Hydrogen sulphide	0.0168	0.53
Ammonia	0.172	5.43
Methane	0.0525	1.656
Formic acid	0.0525	1.656
Acetic acid	0.0525	1.656
Valeric acid	0.0525	1.656
Formaldehyde	0.0525	1.656
Methyl spirit (carbinol)	0.0525	1.656
Ethyl spirit	0.0525	1.656

Volume of exhaust gas from the internal combustion engines at the West Transfer Station is specified in Table 8.1.2.

Table 8.1.2 Volume of Exhaust Gas from Internal Combustion Engines at the West Transfer Station

Substance	MPC, mg/m³		Hazardous level	Volume of emissions	
	max	average		g/sec	Ton/year
Soot	0.15	0.05	3	0.0168	0.681
Sulfur dioxide	0.5	0.05	2	0.0222	0.879
Nitrogen dioxide	0.085	0.04	2	0.0432	1.918
Carbon oxide	5	3	4	0.1074	4.866
Hydrocarbons	5	1.5	4	0.0324	1.283
Benzapilene	0.1 mkg/100 dm³	-	1	0.336×10^{-6}	9.52×10^{-5}

Total pollutant emissions into the atmosphere at the Spasskaya Transfer Station are specified in Table 8.1.3.

Table 8.1.3 Pollutant Emissions into the Atmosphere at the Candidate Site for Spasskaya Transfer Station

Pollutant	Volume of emission	
	g/sec	Ton/year
Carbon oxide	0.0539	2.084
Hydrocarbons	0.0164	0.549
Nitrogen dioxide	0.0216	0.821
Soot	0.0084	0.292
Sulfur dioxide	0.0111	0.376
Benzapilene	0.168×10^{-6}	4.07×10^{-6}
Hydrogen Suphide	0.0069	0.218
Ammonia	0.071	2.24
Methane	0.0218	0.688
Formic acid	0.0218	0.688
Acetic acid	0.0218	0.688
Valeric acid	0.0218	0.688
Formaldehyde	0.0218	0.688
Methyl spirit (carbinol)	0.0218	0.688
Ethyl spirit	0.0218	0.688

Volume of exhaust gas from the internal combustion engines at the Spasskaya Transfer Station is specified in Table 8.1.4.

Table 8.1.4 Volume of Exhaust Gas from Internal Combustion Engines at the Spasskaya Transfer Station

Substance	MPC, mg/m³		Hazardous level	Volume of emissions	
	max	average		g/sec	Ton/year
Soot	0.15	0.05	3	0.0084	0.292
Sulfur dioxide	0.5	0.05	2	0.0111	0.376
Nitrogen dioxide	0.085	0.04	2	0.0216	0.821
Carbon oxide	5	3	4	0.0539	2.084
Hydrocarbons	5	1.5	4	0.0164	0.549
Benzapilene	0.1 mkg/100 dm³	-	1	0.168×10^{-6}	4.07×10^{-5}

Calculation of surface concentrations on the Spasskaya and West stations was made in design rectangle 4000m × 4000m and in the points of routing grid 250m × 250m. Since there was no transfer station location map-scheme of the required scale, the size of design rectangles took into account the scale of spreading map – 1:20,000. The household sites were presented in the same scale.

In view of the large area of the West Transfer Station (3ha) and the Spasskaya Transfer Station (2ha), and insignificant values of harmful gaseous pollutants and smelling substance emissions and long time computer calculation of surface concentration fields, the total area of each transfer station was divided into 4 equal sites of 100m × 50m and, according to this, calculated emissions from the area 100m × 50m were diminished.

Background concentrations in the area of transfer station are not registered, so that the factor of quality of the atmospheric air is accepted as the ratio $C \leq 1$, which was reached on the border of the sanitary-protection zone and in the residential area.

Coefficient A depends on the temperature stratification of the atmosphere and determines conditions of horizontal and vertical spreading of pollutants at the territory of Kazakhstan, and is equal 200.

Analysis of fields of pollutant spreading in the atmosphere surface layer was made taking into account wind force – 5 m/sec, which periodicity is 5%. Meteorological characteristics and coefficients, which determine condition of pollutant spreading into the atmosphere, are shown in Table 8.1.5.

Table 8.1.5 Meteorological Characteristics and Coefficients determining Condition of Pollutant Spreading into the Atmosphere

Characteristics	Value
Coefficient depending on stratification of atmosphere, A	200
Coefficient of relief, η	1
Average maximum temperature of the hottest month, °C	29.8
Average minimum temperature of the coldest month, °C	- 7.4
Average wind rose, %	
N	10
NE	11
E	11
SE	5
S	15
SW	20
W	20
NW	8
Calm	8
Wind force (u*) corresponds to the average multiyear data, wind force periodicity – 5%, m/sec	5

Table 8.1.6 Pollutant Spreading in the Atmosphere

Pollutant	PDK, mg/m³	Wind directions of the sanitary-protection zone								Background
		N	NE	E	SE	S	SW	W	NW	
West Transfer Station										
Hydrogen Sulfide	0.008	0.49	0.684	0.684	0.716	0.632	0.716	0.684	0.679	0
Ammonia	0.02	0.201	0.246	0.52	0.388	0.259	0.285	0.280	0.278	0
Methane	50	Calculation is not necessary to carry out, because Q< 0.1								
Formic acid	0.2	0.061	0.0752	0.0855	0.118	0.079	0.161	0.0855	0.0848	0
Methyl spirit	1	0.0123	0.015	0.0171	0.0237	0.0158	0.032	0.0171	0.017	0
Valeric acid	0.03	0.41	0.501	0.57	0.597	0.527	0.597	0.57	0.565	0
Formaldehyde	0.035	0.351	0.43	0.489	0.512	0.451	0.512	0.489	0.485	0
Acetic acid	0.2	0.061	0.0752	0.0855	0.118	0.079	0.161	0.0855	0.0848	0
Ethyl spirit	5	0.0024	0.003	0.00342	0.0047	0.00316	0.0064	0.00342	0.00339	0
Coordinates of sanitary - protection zone										
X		15300	15650	15750	15650	5300	4950	14850	14950	
Y		14250	14150	13900	13750	13650	13750	13900	14150	
Spasskaya Transfer Station										
Hydrogen Sulfide	0.008	0.205	0.205	0.275	0.264	0.211	0.264	0.219	0.251	0
Ammonia	0.2	0.087	0.123	0.116	0.0988	0.089	0.112	0.116	0.123	0
Methane	50	Calculation is not necessary to carry out, because Q< 0.1								
Formic acid	0.2	0.0263	0.0371	0.0353	0.0338	0.027	0.0338	0.0353	0.0216	0
Formaldehyde	0.035	0.15	0.212	0.201	0.185	0.154	0.194	0.201	0.212	0
Valeric acid	0.03	0.175	0.247	0.214	0.226	0.18	0.226	0.462	0.215	0
Acetic acid	0.02	0.0263	0.0371	0.0353	0.0338	0.027	0.0338	0.0353	0.0216	0
Methyl spirit	1	0.0052	0.0074	0.007	0.0068	0.0054	0.0068	0.007	0.0064	0
Ethyl spirit	5	0.0017	0.00148	0.00141	0.0013	0.0011	0.0013	0.00141	0.00148	0
Coordinates of sanitary - protection zone										
X		0	300	400	350	0	-350	-400	-300	
Y		350	350	0	-250	-350	-250	0	250	

The calculation shows that the surface concentration of all pollutants reaches tenth or hundredth parts of PDK values.

Therefore, a conclusion may be drawn that the process of transfer station operation will satisfy the requirement on standard quality of the atmospheric air - $C \leq 1$, i.e., maximum permissible concentrations (PDK) are reached even to accept assumptions on complete aerobic decomposition of food wastes during transfer work at the transfer stations.

Table 8.1.6 presents values of maximum surface concentrations by PDK values for eight wind directions.

The pollutants' emissions are insignificant and air pollution will have adverse effect only on those people who has a direct contact with vehicles and wastes, i.e., in the operational zone, where it is necessary to apply means of individual protection and to use less toxic fuel for vehicles. Practically, these impacts are spread within the stations' borders and may be observed from the leeward side as smell, which is not registered by the regulations. The sanitary-protection zones of the West and Spasskaya stations have the minimum size of 300m stipulated in the sanitary rules and norms of the Republic. The landscape improvement of the zone will eliminate the question on impact of the stations on the air of adjacent territories.

8.2 Surface and Ground Water

8.2.1 West Transfer Station

In the zone of the West Transfer Station, there are no surface water streams and reservoirs, so that water draining at the West Transfer Station is not subject to regulations. It is necessary to execute in the established order, permission on special water use (from the water well).

A temporary runoff, which occurs resulting from rainfalls and snow melting, has no significant impact on the surface and ground water. In the process of landscape improvement, this runoff will be fully absorbed and used by trees, shrubs and grass.

8.2.2 Spasskaya Transfer Station

According to the accepted technology, the solid wastes are treated and are transferred from light-duty trucks into heavy-duty vehicles at the territory of transfer stations. It is not envisaged to store wastes at the transfer station site, and this reduces the potential impact of the Spasskaya Transfer Station on the ground and surface water.

Hydro-geological and geological conditions of the territory and the Spasskaya transfer station situation (groundwater occurrence at the depth more than 12m, layer-like structure of surface deposit, and anthropogenic factors) provide high protection of ground water from pollution.

Besides, the conditions below would contribute to the protection of ground water:

- Compliance with technological procedures;
- Waterproofing of station territory without ground removal; and

- Drainage of sewage water in the volume of 3 m^3/day into the city sewerage system or leaching cesspit.

The impact of the Spasskaya Transfer Station on the surface and ground water will be practically eliminated.

Occasional discharges into the environment will be easily eliminated because there is no surface washout from the station site and the surface water is highly protected.

8.3 Soil

8.3.1 West Transfer Station

There will be insignificant contribution of the station in the pollution of environmental conditions due to the low level of impact on the soil covering (landscape) of the adjacent territories. The strict performance of well-defined project decisions and operating rules ensures the operational safety of the station and its insignificant impact on the soil and ground of the main construction sites and the sanitary protection zone.

In accordance with the EIA procedures, the contingencies should be considered as "emergency situation" at the worst combination of negative factors. For the West Transfer Station, it is a landslide, which can occur resulting from water leakage, precipitation and erosion, and also during an earthquake of magnitude 9 marks or less. The situation at the heat-electric generating station (TES-2) is catastrophic and it is connected with carrying over ground under the site. This process will last during 10 years. This situation is also worrisome and careful consideration on the correct organization and maintenance of the station and its sanitary-protection zone in the present topographical and soil-ground conditions may have a big importance in safety of the station and the down located TES-2.

Traffic accidents may cause environmental pollution, including the spread of infections by air and waterways. Therefore, it is necessary to immediately eliminate accident consequences and to disinfect contaminated areas.

8.3.2 Spasskaya Transfer Station

The production capacity of the Spasskaya Transfer Station is less than that of the West Transfer Station, thus the negative impact on the soil-cover and landscape will be insignificant. The soil quality of the Spasskaya Transfer Station and around it is three times less than the soil quality of the West Transfer Station because of technological development. The impact caused by the Spasskaya Transfer Station is insignificant. The subsoil of the site is thick and emergency situations are not expected. Besides, there is no drainage at the site and conditions for water erosion are absent.

There is a probability of traffic accidents and environmental pollution at the site. The measures to be taken are the same as for the West Transfer Station.

The future condition of soil at the territories within the Spasskaya and the West transfer stations will depend on efficient organization and correct protection of the sanitary protection zones.

According to the sanitary norms #1.01.001.-94 for designing production facilities, the sanitary-protection zone of both transfer stations should not be less than 300 meters wide. These zones should include places where pollution from the populated localities will be emitted into the atmosphere. In order that there are no populated localities at the distance of 1500 m from the project site, the sanitary-protection zone will serve as a transition zone between production territory and territory with other functions. The sanitary-protection zones are zones with special regulatory conditions for nature use. The sanitary norms (Addendum 2 for the section "Sanitary-protection zones and sanitary classification of enterprises, constructions and other facilities", 23.09.98) provide for successive development of sanitary protection zones by territorial organization, land improvement and planting trees, during the whole period of preparation of pre-project and project documentation.

The Master Plan formulated in the Study does not involve developments (and "Preliminary EIA") on sanitary-protection zones of the stations, therefore, funds for designing these zones were not provided. The question concerning performance of the relevant project documentation in future may only be brought forward.

The environmental situation in the regions of the West Transfer Station and the Spasskaya Transfer Station requires performing a series of natural protective measures.

Taking into account the concentration of lead, the environmental situation is unfavorable and will become worse by discharging from the stations even small amount of pollutants during the years. In this connection, it is necessary to perform additional research on affected landscapes (geo-chemical survey, pollutant movements in the food chains) that allows provision of more precise substantiation of natural protective activities.

Currently, the environmental situation at the territories of prospective sanitary-protection zones is evaluated (using the rate of individual risk) as $10^{-3} - 10^{-2}$ per person per year (deterioration of biota, high rate of disease and mortality of some groups of people), but after landscape improvement the risk may decrease to 10^{-4}.

That is why for the sanitary-protection zone it is necessary to develop the project documentation on landscape improvement taking into consideration the following problems: condition of nature use, planting trees, creation of surface drainage and soil decontamination. The solution of the problem on surface discharge will decrease the risk of water erosion and gravitational washout processes.

It is evident that nature protective measures should be supported by observations, controls and assessment of situation, i.e., monitoring. According to the value of depreciation period, the main facilities of the stations must operate for 50 years before it will be necessary to carry out overhaul and improvement; however, during this period the probability of earthquakes is not eliminated. The probability of earthquakes was not evaluated.

Measures to be taken for motor transport are standard; the road must be of good quality with green plantations and serviceable equipment must be available, with natural fuel and proper workers.

The problem on social tension arose because of negative impact of transfer stations on the cemeteries and it should be solved by improving the landscape of the sanitary-protection zone.

8.4 FLORA AND FAUNA

8.4.1 Flora

1) West Transfer Station

During the construction period, the plant-cover at the site with main facilities and constructions will be defoliated. Insignificant pollution of the environment caused by the station operation can preserve natural plant associations under existing conditions. Generally, the plant-cover of sanitary-protection zone will be purposefully formed in accordance with the decisions of "Project on development of the sanitary-protection zone" during the next project phase.

2) Spasskaya Transfer Station

There is no natural plant cover at the project site and within the sanitary-protection zone, thus, it will not be damaged by the negative impacts. The existing pioneer plant cover growing with weeds and the existing tree belt will be included into the system of land improvement according to the "Project on development of the sanitary-protection zone", which will be developed during the nest project phase.

8.4.2 Fauna

The area of the West Transfer Station allotted for the construction is not very large; consequently, animals inhabiting this territory will have small losses in their quantity and places of habitation. There is a probability of insignificant faunistic movement and change in quantity.

The area allotted for the construction of the Spasskaya Transfer Station is also small; therefore, the negative impact on the animals will be insignificant. The fauna of this site is presented by the species inhabiting the Bolshaya Almatinka River and its floodplain. Additionally, it includes the birds inhabiting the forest belts and plantations of bushes. The other species will be driven out during constructional phase, but at the end of this phase the animals will inhabit the sites again.

The bats, gnawing animals, carnivores and, especially, birds will not be damaged. The birds can easily change their place of habitation, and probably they will fly to the border of the disposal site.

There is probability of negative impact on the fishes inhabiting the Sultatka River resulting from the river bottom pollution.

For the most detailed assessment of fauna conditions at the West and the Spasskaya transfer stations, it is necessary to perform researches all the year round. To perform this, it is necessary to allocate financial assets and attract qualified specialists.

CHAPTER 9 CONCLUSION

The results of predicted impacts caused by the West and Spasskaya transfer stations on the atmospheric air, surface and ground water, soil, and flora and fauna show that the level of impact is not significant. These impacts will not affect the social and economic conditions of population living in the considered regions.

Increase in traffic intensity of the roads bordering with the project sites will not cause reconsideration of road categories because even the total load on these roads (taking into account operation of transfer stations) will not exceed the established standards (see, Subsection 5.1).

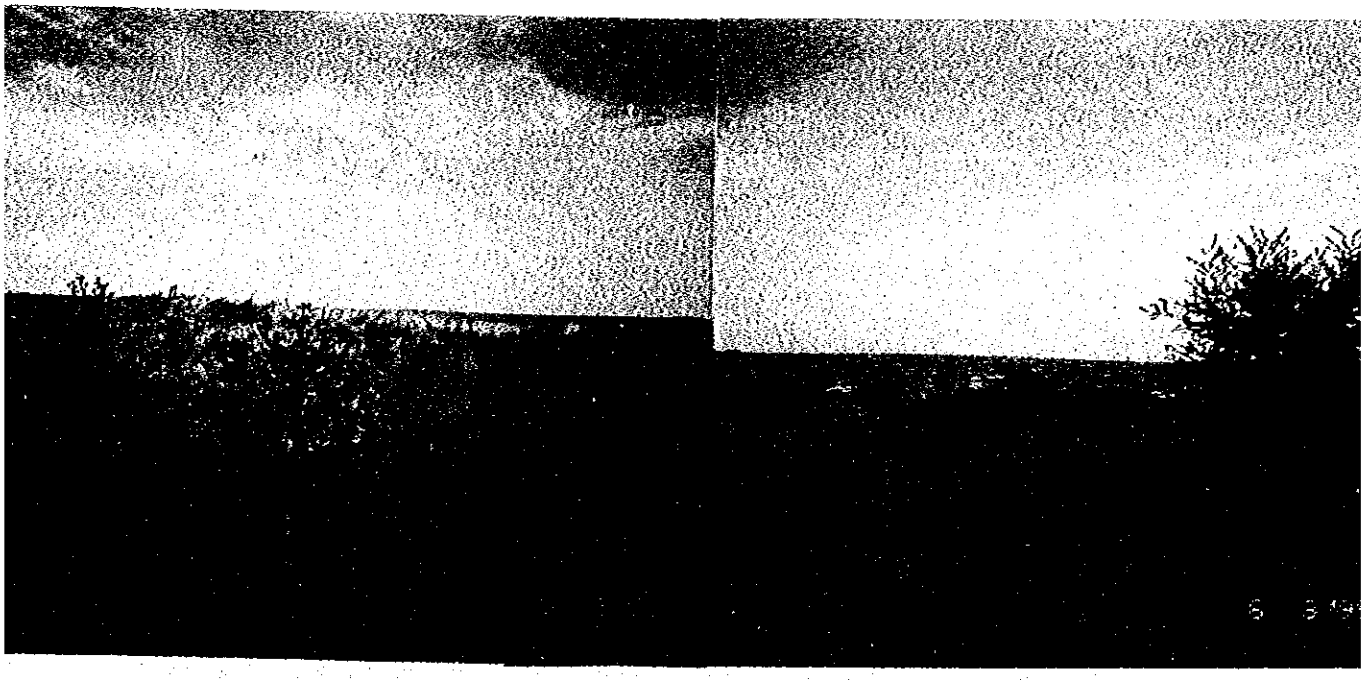
In addition, the impact on the landscape of the territory where the project site is located will not be significant. The suburban landscape will not be affected at all. At the West Transfer Station, the plough-land will be changed into industrial landscape. At the Spasskaya Transfer Station, one type of industrial landscape (not used sewage treatment lagoons) will be changed into another type of industrial landscape-waste transfer station.

However, it is necessary to note that the data stated above were obtained resulting from work performed in accordance with the requirements stated in the Republican Standard Document dated from December 30, 1993 intended for use during preparation of preliminary environmental impact assessment. In this connection, the obtained results should be considered as primary data and must be specified in detail.

To obtain full information covering these questions, it is necessary to perform a full-scale environmental impact assessment (EIA), which should be carried out under the special conditions of financing and in accordance with the appropriate terms based on the coordinated work schedule.

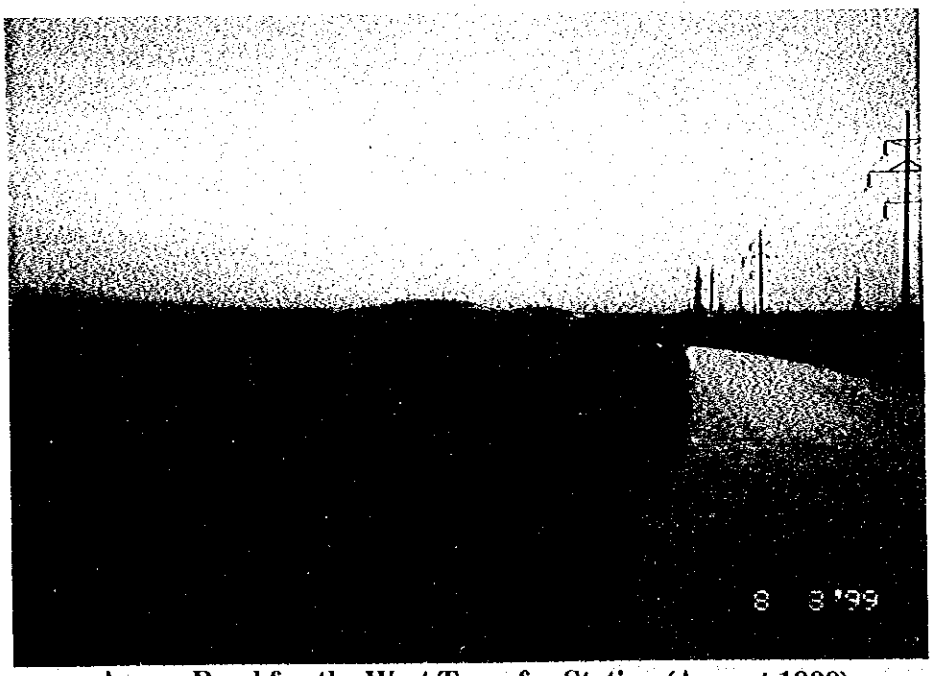
PHOTOGRAPHS
OF
THE SURVEY SITE

General View of Candidate Site for the West Transfer Station (April 1999)

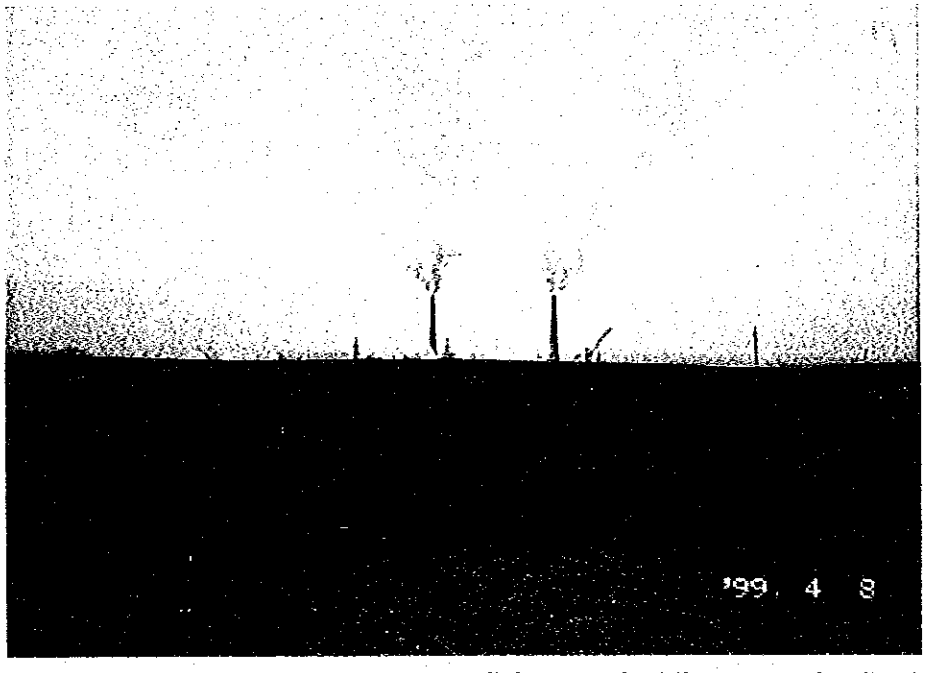


General View of Candidate Site for the West Transfer Station (August 1999)

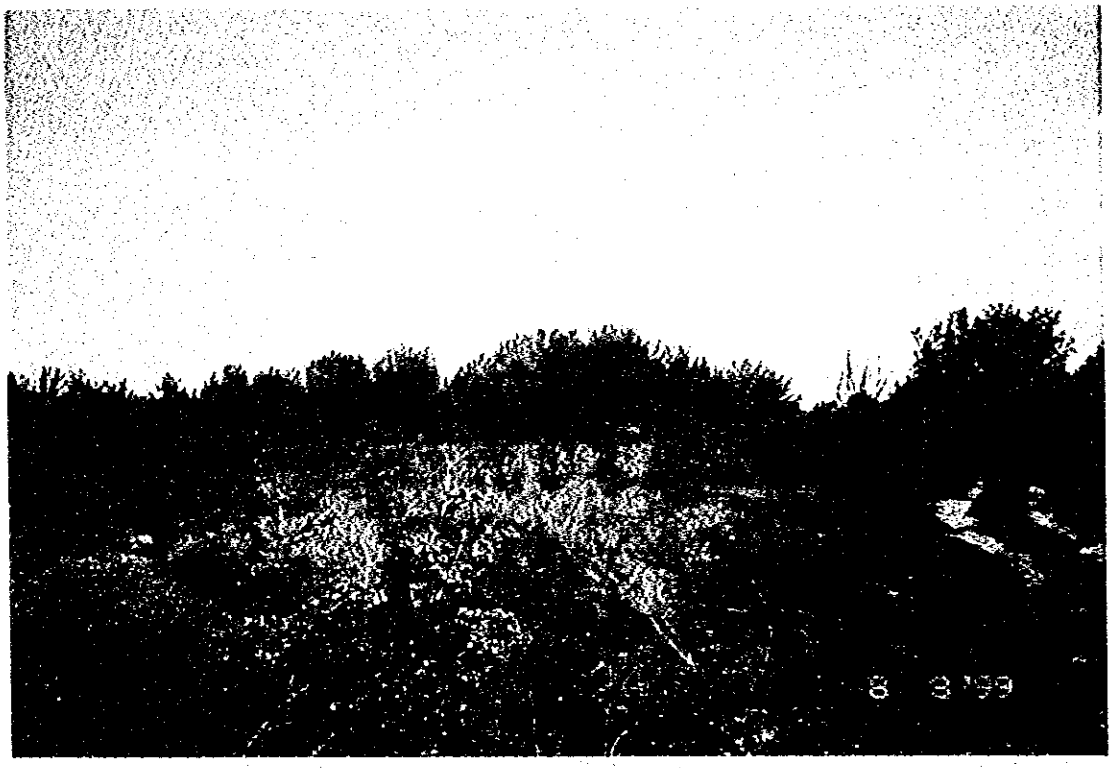
Access Road for the West Transfer Station (April 1999)



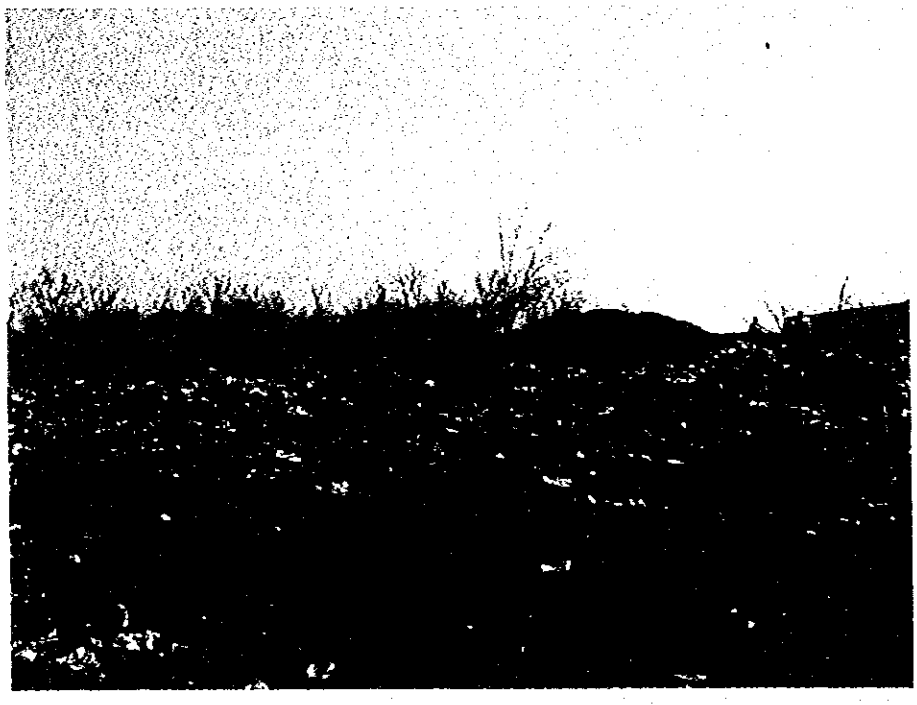
Access Road for the West Transfer Station (August 1999)



Heat-electric Generating Station (TES-2) near the West Transfer Station (April 1999)

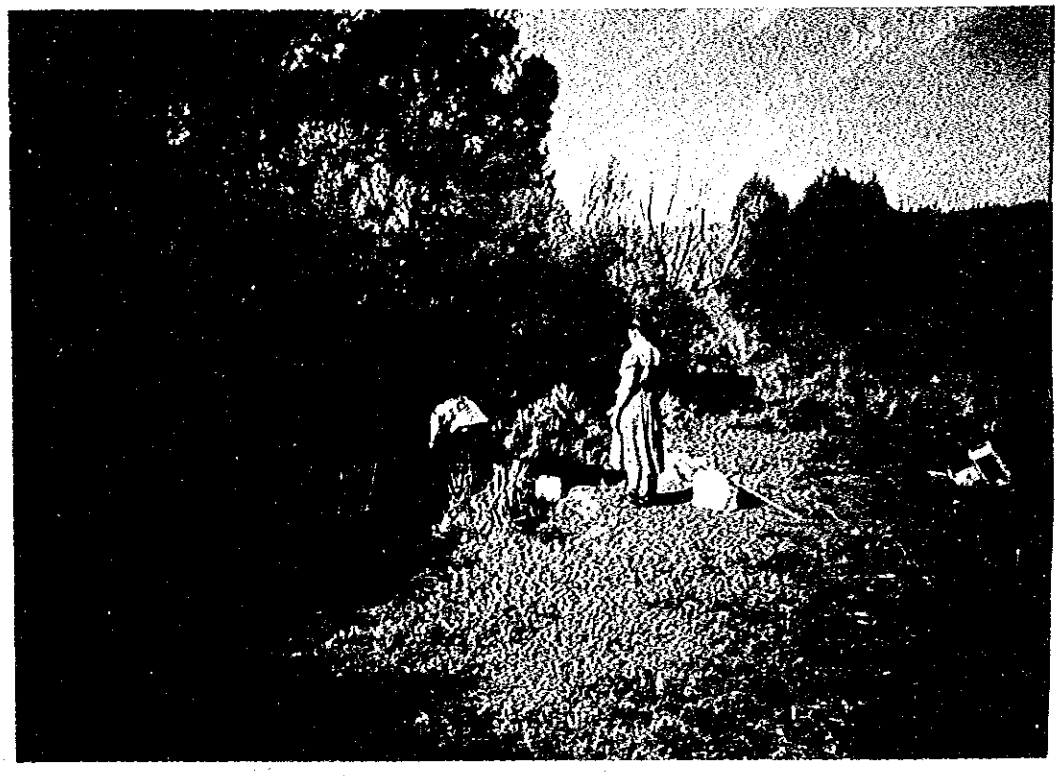


General View of Candidate Site for the Spasskaya Transfer Station (August 1999)



Spasskaya Dumpsite near the Spasskaya Transfer Station (February 1999)

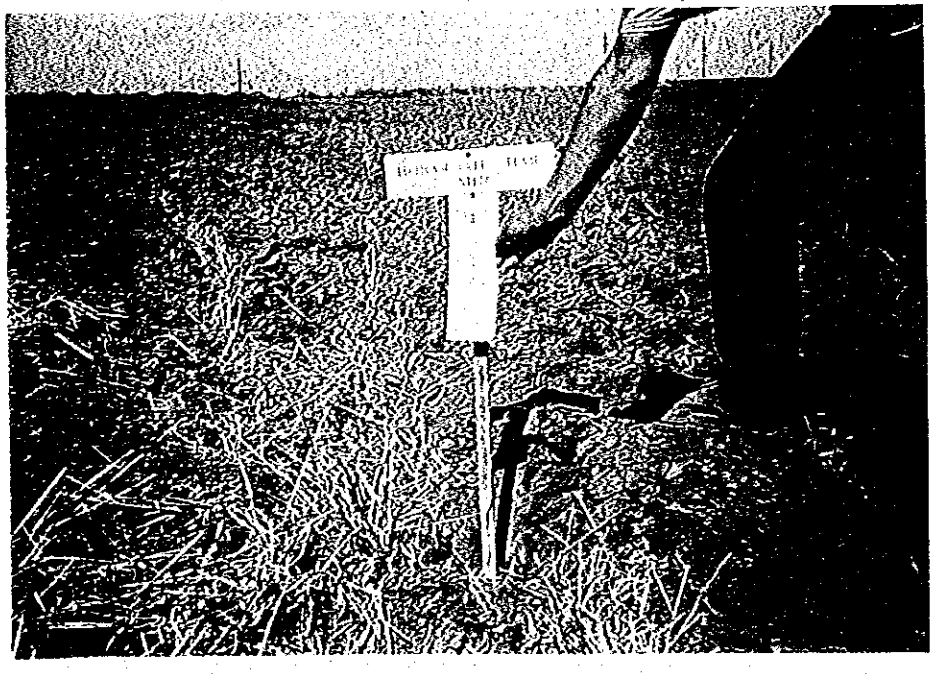
Spasskaya Dumpsite near the Spasskaya Transfer Station (August 1999)



Water Sampling from Moila River downstream of the Spasskaya Transfer Station (August 1999)

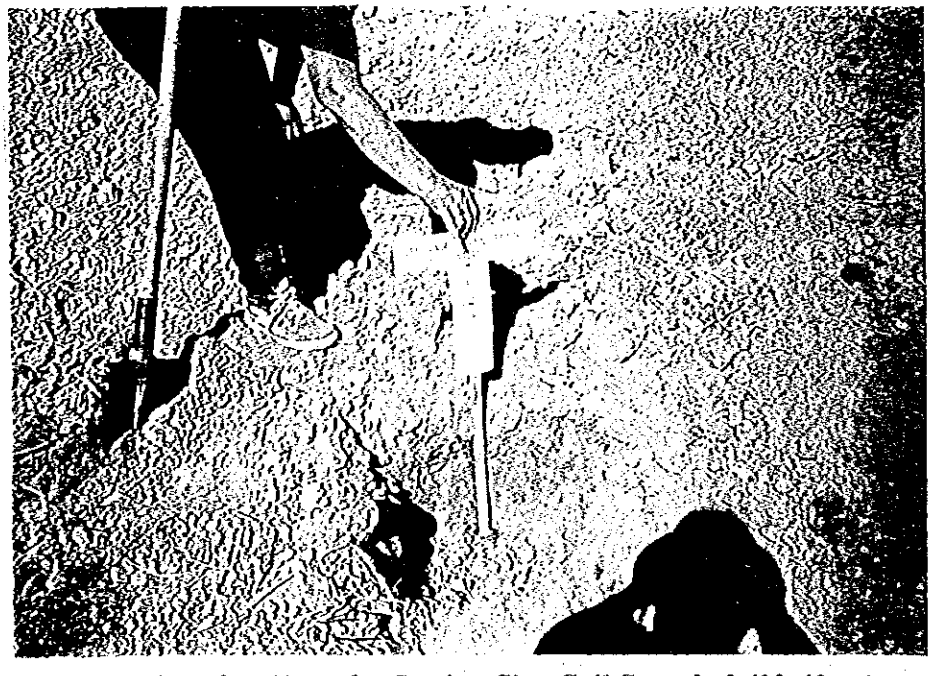
PHOTOGRAPHS
OF
SOIL SAMPLES AND SAMPLING PLACES

General View of Candidate Site for the West Transfer Station

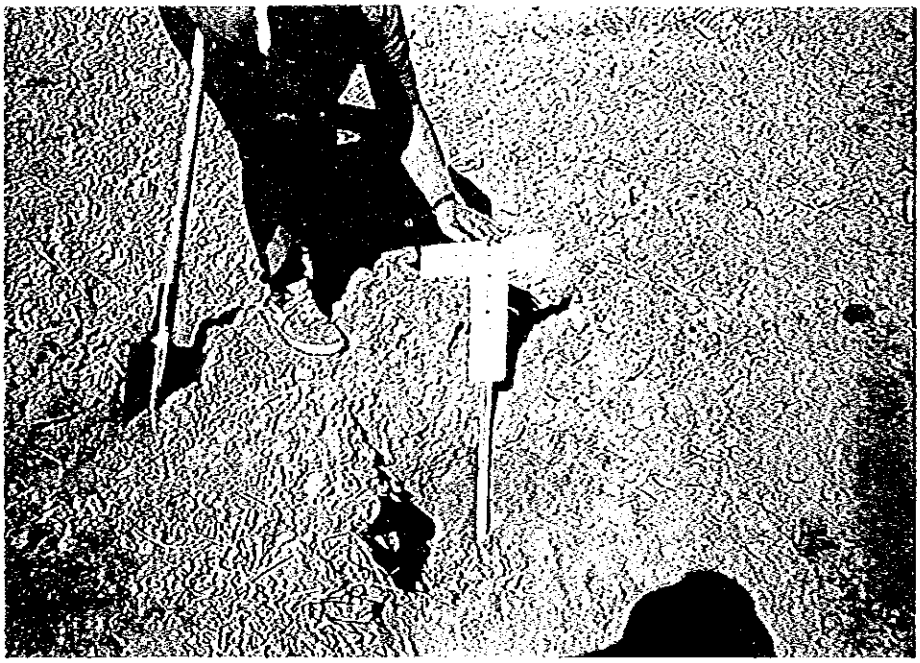


The West Transfer Station Site, Soil Sample 7 (20-40cm)

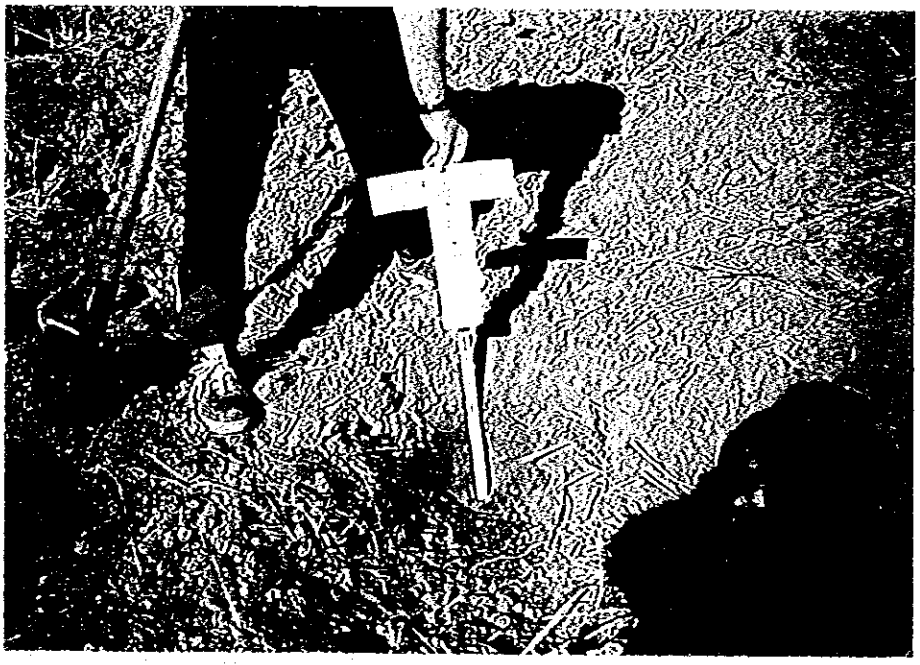
The West Transfer Station Site, Soil Sample 8 (0-20cm)



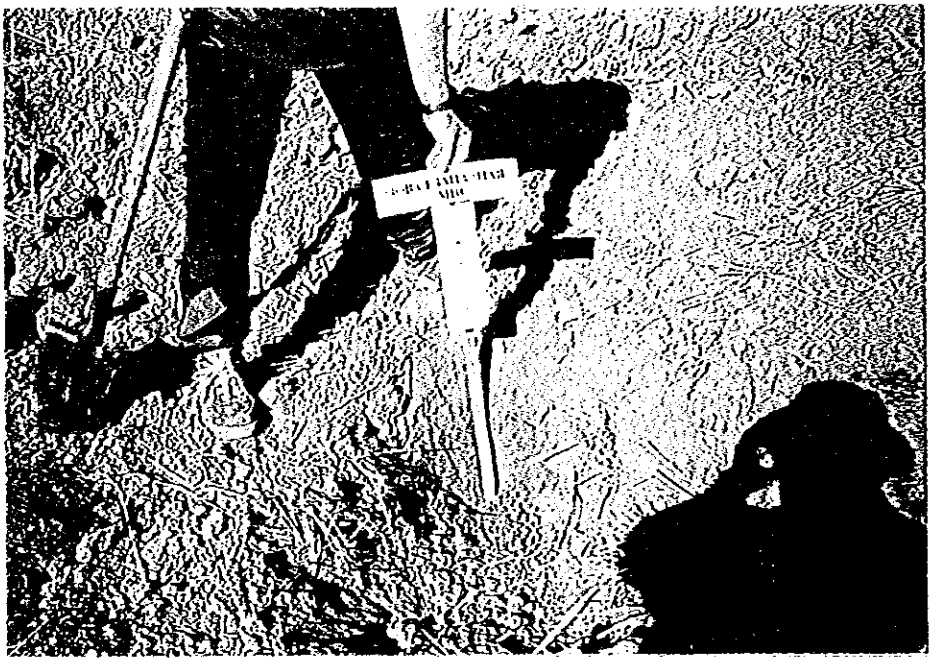
The West Transfer Station Site, Soil Sample 9 (20-40cm)



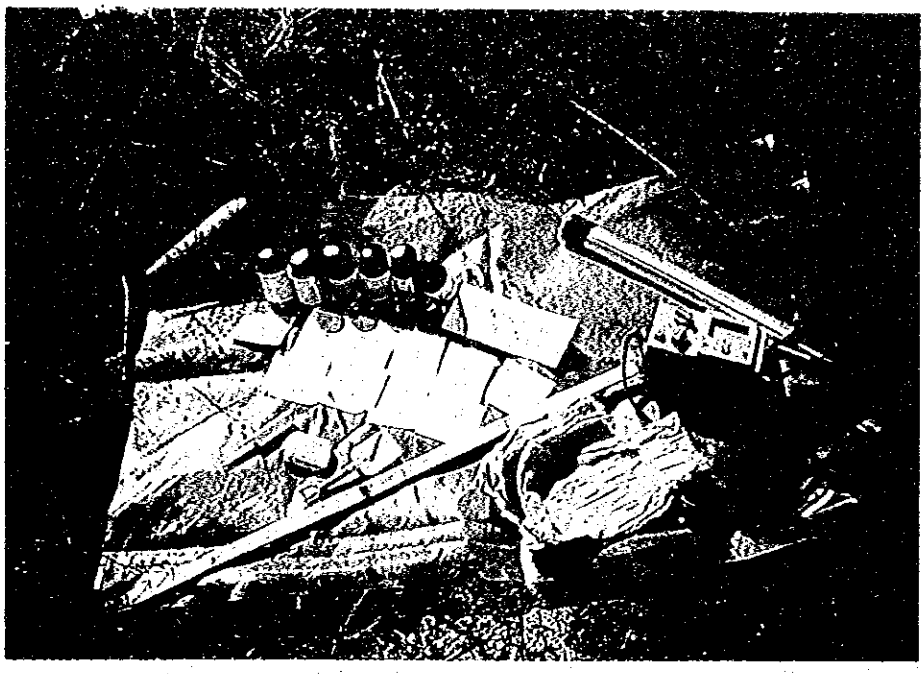
The West Transfer Station Site, Soil Sample 10 (0-20cm)



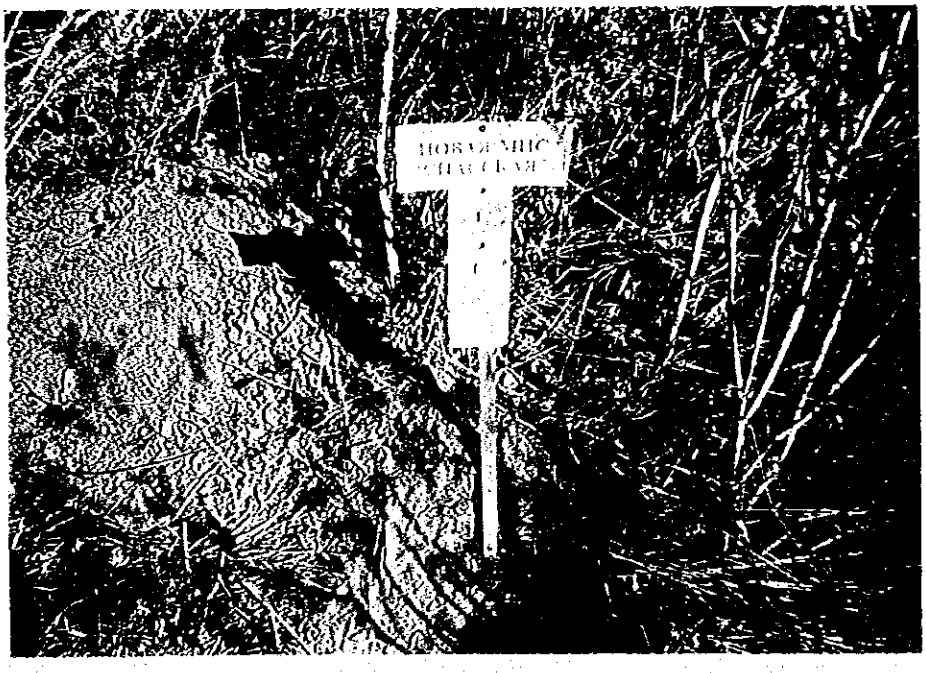
The West Transfer Station Site, Soil Sample 11 (20-40cm)



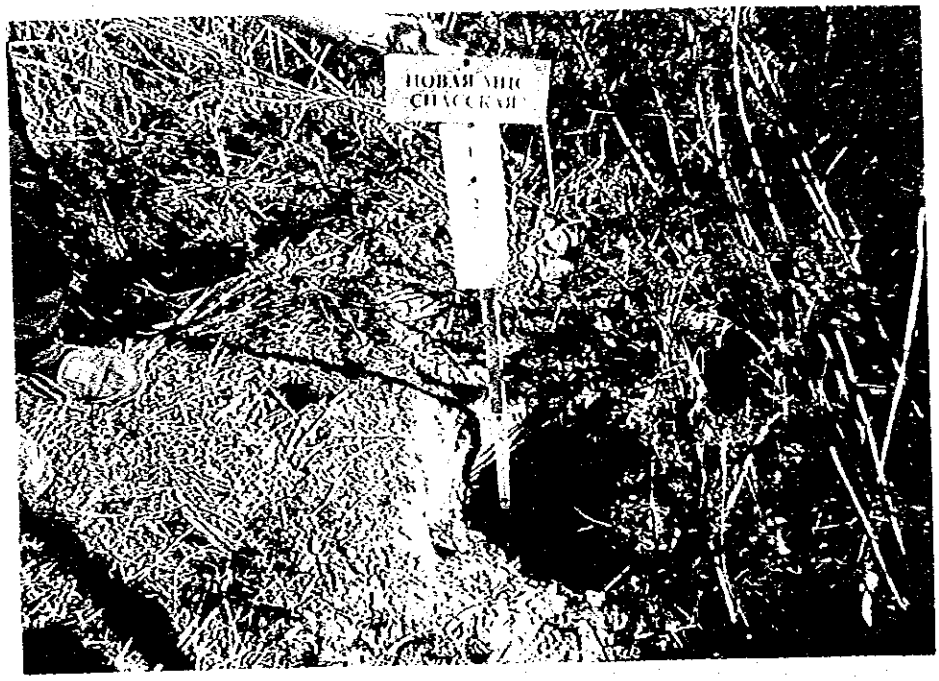
The West Transfer Station Site, Soil Sample 12 (0-20cm)



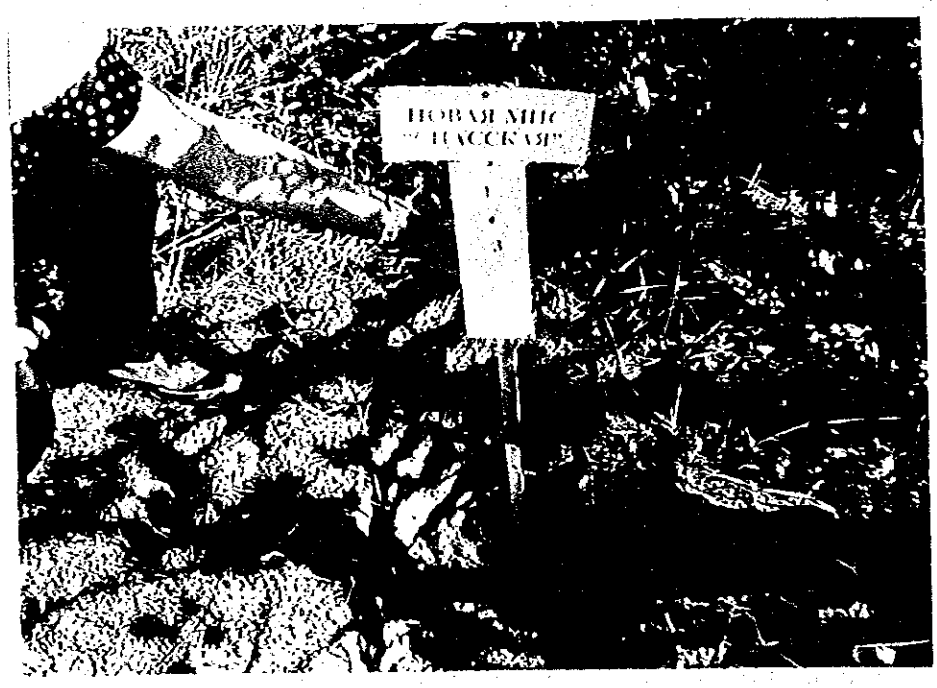
Tools used for Soil Sampling



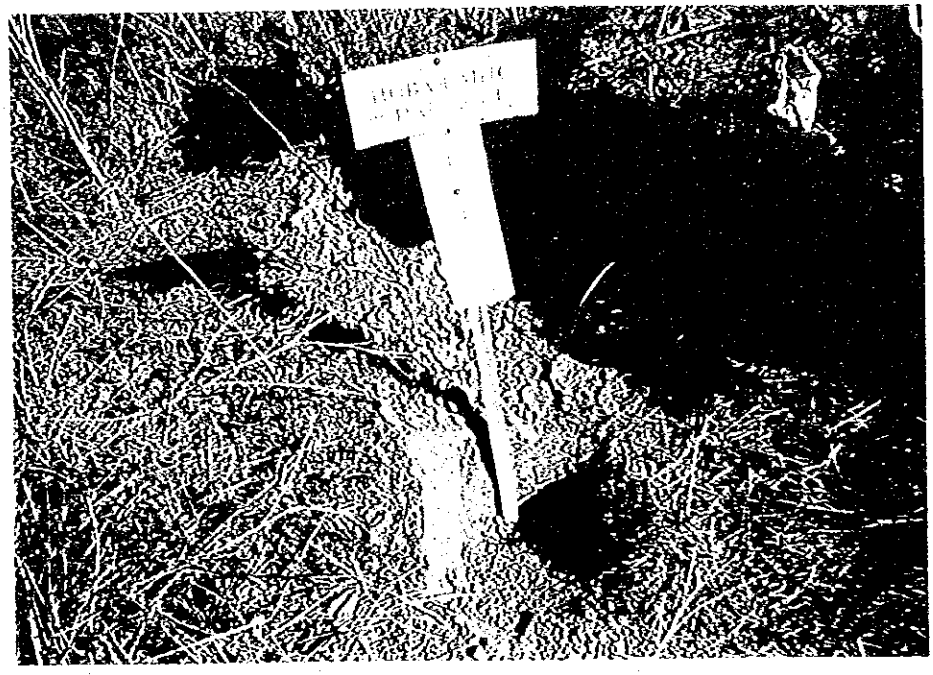
The Spasskaya Transfer Station Site, Soil Sample 1 (0-5cm), Site #1



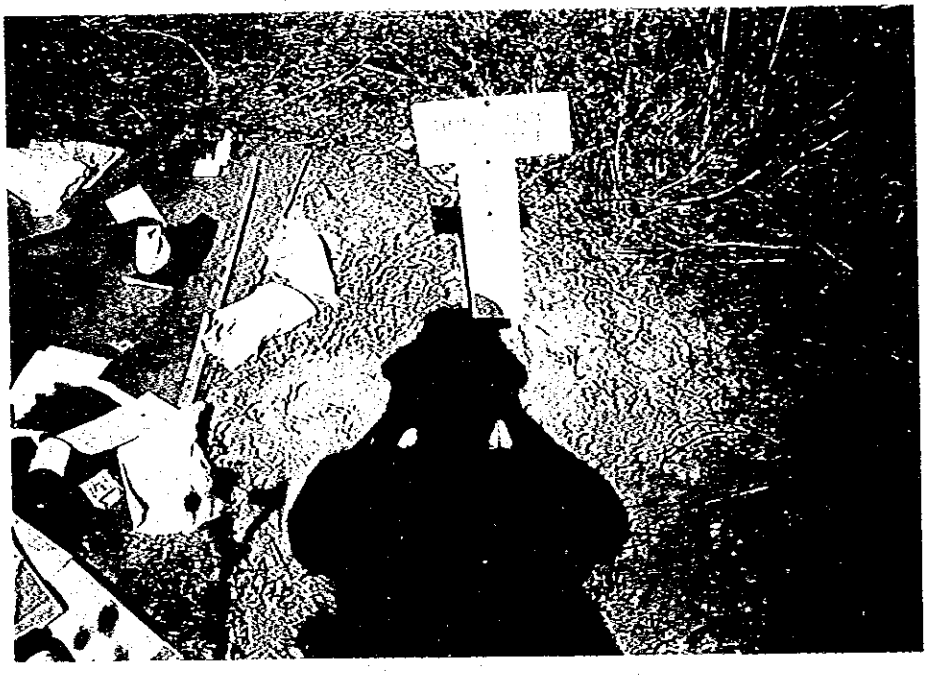
The Spasskaya Transfer Station Site, Soil Sample 2 (5-20cm), Site #1



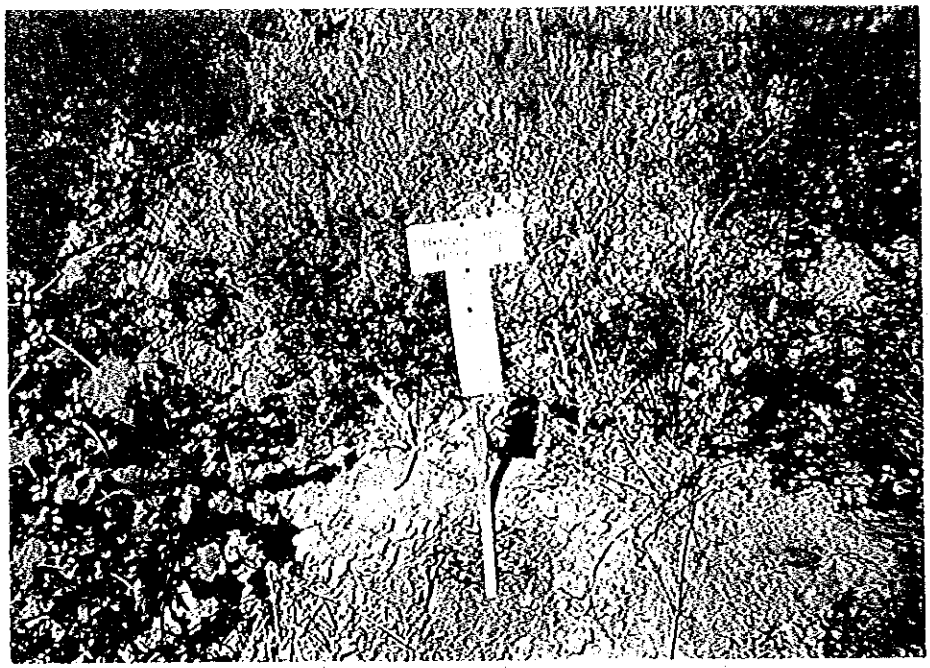
The Spasskaya Transfer Station Site, Soil Sample 3 (0-5cm), Site #2



The Spasskaya Transfer Station Site, Soil Sample 4 (5-20cm), Site #2



The Spasskaya Transfer Station Site, Soil Sample 5 (0-5cm), Site #3



The Spasskaya Transfer Station Site, Soil Sample 6 (5-20cm), Site #3

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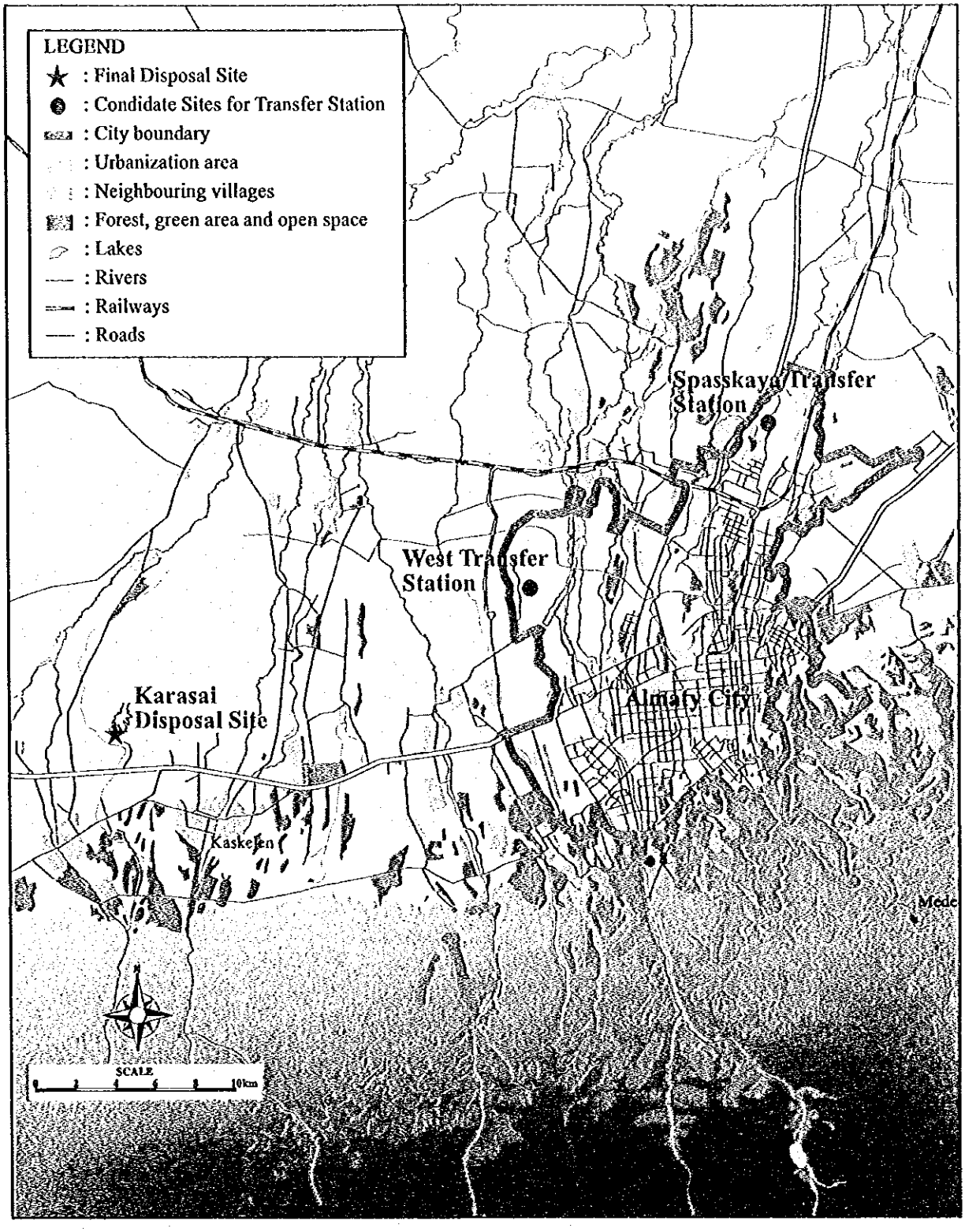
PART II

DRAFT
OF
ENVIRONMENTAL IMPACT ASSESSMENT
FOR
IMPROVEMENT OF KARASAI DISPOSAL SITE



LOCATION MAP

PART II SUMMARY

ENVIRONMENTAL IMPACT ASSESSMENT FOR IMPROVEMENT OF KARASAI DISPOSAL SITE

The Karasai Disposal Site subject to improvement is located in Karasaisky, Almaty Oblast. The administrative regional center is located in Kaskelen City, and the oblast center is located in Almaty City. The disposal site is located 2.3 km to the north from the of Almaty-Bishkek road and 3 km to the west from the International village (Aitey village). The territory of the disposal site is presented by hilly land – steppe without trees and bushes.

The Karasai Disposal Site constructed by the Administration on Improvement of Almaty Executive Committee was put into operation in December 29, 1989. This disposal site was considered to be a special facility for waste storage and disposal, and to provide environmental reliability and sanitary-epidemiological safety.

The territory down the ravine is used for solid waste storage; that is, the dam embankments were made for collecting the leachate and removing it into the pond located between the dams. Behind the downstream dam, three observation wells were constructed for ground water observation. The results of field survey and data on laboratory analysis of the water shows hydraulic connection among groundwater and leachate, rain water, and snow water at the territory of the disposal site.

Electric power supply of the Karasai Disposal Site is provided through an isolated generating plant, and water supply is provided by water that is brought by a water tanker. Furnace heating is used at the site, however, there is no sewage system and for communication with regional and oblast centers, radio-communication is used.

The objective of the draft environmental impact assessment (EIA) for the Karasai Disposal Site is the identification of economic, environmental and social impacts caused by improvement and operation of facilities located at this disposal site, and also development of proposals on reducing negative impacts on all environmental components and living conditions of population in the adjacent populated localities within the 3 kilometers radius as stated above.

Results of this draft EIA show that improvement of the existing Karasai Disposal Site will significantly reduce negative impacts on the environment of the disposal site, correct collection and suitable conditions for transportation, and eliminate unauthorized dumping sites. The main condition for providing these tasks is the obligatory and timely performance of all project decisions in strict compliance with the established standard on solid waste storage and treatment at the Karasai Disposal Site.

THE STUDY ON
SOLID WASTE MANAGEMENT
FOR ALMATY CITY
IN THE REPUBLIC OF KAZAKHSTAN

FINAL REPORT

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

PART II

DRAFT OF ENVIRONMENTAL IMPACT ASSESSMENT FOR
IMPROVEMENT OF KARASAI DISPOSAL SITE

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CHAPTER 1 INTRODUCTION

1.1 BACKGROUND OF THE ASSESSMENT

The Karasai Disposal Site that is being contemplated for improvement is located in Karasaisky, Almaty Oblast. The regional administrative center is located in Kaskelen City, and the Oblast center is in Almaty City. The disposal site is situated 2.3 km to the north from the 34-km section of Almaty-Bishkek Road and 3 km to the west from International Village (Aitey Village). The disposal site is lowland - steppe without trees and bushes.

The Karasai Disposal Site was constructed in 1988-89 by the Administration on Improvement of Almaty Executive Committee. It was put into operation on December 29, 1989, and was considered to be a special facility for waste storage and treatment, and to provide environmental reliability and sanitary-epidemiological safety with site operations planned until 2010.

The existing facilities of the Karasai Disposal Site are the following:

- Solid waste storage, 23 hectares;
- Administrative zone;
- Water intake facility for administrative needs (does not operate because of lack of electric power);
- Access road to the disposal site (2.3 km long);
- Road to the solid waste storage site; and
- Bio-thermal ferro-concrete pit for burning dead animals.

At the administrative zone, there are the following facilities:

- Household facilities;
- Fenced roof for vehicles and machines;
- Fire water supply;
- Warehouse for combustible and lubrication materials;
- Toilet;
- Disinfection bath filled with Lysol; and
- Transformation substation (does not operate because of dismantling of electric line).

The area down the ravine is used for solid waste storage, and two dam embankments have been made for collecting the leachate and removing it into the pond located between the dams. Behind the downstream dam, three monitoring wells have been constructed for groundwater observation. The results of field survey and data on laboratory analysis of the water shows hydraulic connection among groundwater and leachate, rainwater, and snow water at the disposal site.

Electric power supply to the site is by an isolated generating plant, Yamaha, of Japanese manufacture. Water supply to the site is by a water tanker, and furnace heating is used.

There is no sewage system, and radio communication is used between the regional and Oblast centers.

Due to insufficient collection and transfer of waste, lack of special vehicles and non-compliance with project technology for waste storage at the site, the Karasai Disposal Site currently does not provide environmental reliability and sanitary-epidemiological safety for population of adjacent settlements. Taking the situation caused by solid waste storage into consideration, this draft environmental impact assessment (EIA) has been conducted for a pre-project documentation at the stage of Feasibility Study. The state-owned Scientific and Production Association of Industrial Ecology, Kazmekhanobr, had carried out the environmental surveys required for the assessment based on a contract with the JICA Study Team.

1.2 OBJECTIVE OF THE ASSESSMENT

The objectives of the draft environmental impact assessment for the Karasai Disposal Site are the following:

(1) Identification of economic, environmental and social impacts caused by improvement and operation of facilities located at this disposal site; and

(2) Development of proposals on reducing negative impacts on all environmental components and conditions of population living in the adjacent populated localities.

In the process of the draft EIA implementation the following main tasks were performed:

- Data collection and analysis on natural climatic and socioeconomic conditions at the Karasai Disposal Site;
- Additional field survey on environmental conditions with soil and groundwater sampling;
- Identification of environmental impact types;
- Inventory of environmental pollution sources;
- Prediction and evaluation of environmental impacts of the projected sites;
- Development of measures minimizing environmental impact of the stations;
- Specification of EIA directions, taking into account obtaining more detailed project data on the Karasai Disposal Site at the succeeding project phases; and
- Survey on public awareness of Aitey Village (50 households were interviewed to identify the resident's awareness of existing project sites at the Karasai disposal site.).

All of the above stated tasks are presented in the corresponding sections of the enclosed materials.

CHAPTER 2 RESULTS OF THE DATA COLLECTION ON ENVIRONMENTAL AND NATURAL CONDITIONS OF THE SITE AND DATA ANALYSIS

2.1 TOPOGRAPHIC CONDITIONS

The Karasai Disposal Site is located on the undulating plain and ridged foothills of the northern micro-slope of the Zailisky Alatau within a desert and steppe vertical zone with absolute surface levels from 764m up to 869m. This disposal site is a natural, Y-type ravine stretching from North to South.

Ravine slopes are steep and turf-covered. Ravine width and depth decrease to the north from 350-340m up to 150-140m and from 95-90m up to 40-35m, accordingly. Relief of the disposal site is strongly cut and its surface is represented by a combination of ravines, hills and ridges with flat tops inclined to the north. In geomorphology aspect, this site belongs to alluvial-prolluvial plain.

2.2 GEOLOGICAL CONDITIONS

Low-Quaternary alluvial-prolluvial deposits represented by loess-like loam take part in the geological structure of the Karasai Disposal Site. This loam is re-covered by soil-vegetation layer of 0.2-0.3m from surface. Ground conditions concerning subsidence are of loam subsidence type (L) excluding loam of ravine slopes and bottom (site for storage of solid waste, directly), which are not of subsidence type. Filtration coefficient of loam of subsidence type is determined by 1.59 m/day and of loam of non-subsidence type is determined by 0.014 m/day. Grounds are not salted. Region seismicity is 9.

Detailed description of engineering and geological conditions of the specified site is given in the report on its engineering and geological survey, which was performed by the Kazakh State Institute of Engineering Survey (KazGIIZ) under an agreement with the JICA Study Team.

2.3 HYDRO-GEOLOGICAL CONDITIONS

As to hydro-geological characteristics the region where the Karasai Disposal Site is situated is a part of the Ili artesian basin. The Zailisky Alatau, peaks of which are covered by glaciers, is recharged of groundwater. Precipitation of the mountain ridge is partially filtered and partially flown down, forming currents almost completely filtered in friable deposits of the intermontane Ili depression. Water bearing horizons belong to current Upper-Quaternary, Middle-Quaternary and Low-Quaternary deposits within the region. Current alluvial deposits are characterized by small thickness (from 0-10 mm up to 25 mm) with depth of groundwater bedding from 0-2.2m up to 7.2m.

Water bearing complex of Middle-Upper-Quaternary alluvial-prolluvial deposits is widely developed within the Kaskelen group of debris cone. Groundwater underlying depth is up to 200m there. Water is fresh, of good quality and is used only for drinking.

Water bearing complex of Low-Quaternary deposits is developed within interfluvial areas. Groundwater bedding depth is 120-178m there. Clear, but slow rise and gradient is typical for level water regime of Low-Quaternary complex. Availability of one minimum and one maximum allows assuming, that formation and replenishment of water complex occurs at the expense of ground filtration from recharging areas of the debris cone side. Observed discharge of well is 5 l/sec.

Groundwater is observed at the depth of 1.5m, only at the ravine bottom on the site of the Karasai Disposal Site. Oscillation amplitude of this groundwater level is 0.8-1.2m.

Groundwater of Low-Quaternary deposits of gravel-pebbles located among loam is accepted as a source of water supply for own needs of the current Karasai Disposal Site. The site for intake structures is located 350m to the South-East of the economic zone of the disposal site along the access road. Observed well water there is sulfate to hydro-carbonate to sodium to calcium, and chloride to sulfate to sodium to calcium. Water hardness is 2.2-2.6 mg-equiv./l; fluorine content is 1-1.2 mg/l, chlorine is from 7.1 up to 18.0, sulfate is from 25 up to 30, hydro-carbonates is from 128 up to 177 and nitrogen dioxide is from 0 up to 0.6. Water follows GOST 2874-80 *"Drinking Water"*. There are no other sources of water supply. Imported water is currently used at the disposal site, because of lack of electricity (electric power line has been dismantled from EPL-10 KV up to substation of intake well).

Through the field investigation on the Karasai Disposal Site, surface drainage and tapered springs were not observed along the bottom of the main ravine. Adjoining shallow gullies and depressions exist.

2.4 METEOROLOGICAL CONDITIONS

Climatic characteristics are given under the data of the nearest Uzun-Agach meteorological station, taking location of the current Karasai disposal site for solid waste of Almaty City into account.

Climate of the specified area is moderate-continental with dry air and many sunny days. Constriction-climatic sub-region is III B. Weight of snow cover is 70 kg/m^2. Normative frost depth of loam is 126 cm. Annual precipitation ("p") is 509 mm, and average annual evaporation is equal to 452.2 mm.

Average multiyear temperature of the coldest month (January) is minus 9.9ºC; average multiyear temperature of the hottest month (July) is equal to 29.5ºC.

The following tables show wind data of the site. The largest wind force, excess recurrence of which is 5% for the given area, is equal to 4 m/sec.

Table 2.4.1 Average Multiyear Recurrence (%) of Wind Direction for Eight Main Points, Calms and Prevailing Wind Direction

N	NE	E	SE	S	SW	W	NW	Calm
13	10	12	9	26	13	8	9	27

Note: N: North, NE: Northeast, E: East, SE: Southeast, S: South, SW: Southwest, W: West, NW: Northwest.

Table 2.4.2 Average Month and Annual Wind Force (m/sec)

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
0.9	1.1	1.3	1.6	1.5	1.5	1.4	1.4	1.2	1.2	1.0	0.8	1.2

Table 2.4.3 Average Quantity of Days with Wind Force > 15 m/sec. during a Year

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
1.2	0.9	1.7	2.6	3.3	4.2	3.6	1.8	1.1	1.4	0.6	0.4	22.8

Table 2.4.4 Average Quantity of Days with Dust Storm during a Year

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
0	0	0.4	0.8	1.0	1.2	1.3	0.9	0.5	0.5	0	0	6.6

2.5 FLORA AND FAUNA

2.5.1 Flora

Vegetation of the current sanitary-protection zone of the disposal site is of desert-steppe type turning to be desert from steppe. Xerophyte perennial cereals – hair worm feather grasses (tyrsa) dominate there. In some places, it is accompanied by scratched fescue (typchak), i.e., by turf like cereals, the typical steppe vegetation. Representatives of desert flora are white land wormwood, ephemerals, ephemeroids, and annual and perennial plants with spring - early summer development cycle. Early in spring, one can see a lot of bulbous ephemeroids, namely, tulips, crocuses and ixiolirions, among which Kolpakovsky's tulips and Ostrovsky's tulips are under the Red Book of Kazakhstan.

The specified territory of the disposal site is occupied by pastures and not irrigated tillage. Gross yield of grass is 4.0-6.4 centner/ha of dry mass and 2.2-3.8 centner/ha of feed units on light chestnut soils. Yield of cop, cereals, motley grass pastures is 15.0 centner/ha of dry mass and 8.4 centner/ha of feed units on meadow light chestnut soils. Yield of plants eaten by cattle is 3.4 centner/ha of dry mass and 1.9 centner/ha of feed units.

As a whole, 758.95 ha of agricultural lands have been under field surveying including 179.6 ha of rainfed tillage, 162.2 ha of follow lands and 417.15 of pastures. It is determined that about half of tillage lands are currently not used according to their assignment and turned to be cop, autumn, and wormwood grass deposits, mainly in the north of the disposal site.

2.5.2 FAUNA

The Karasai Disposal Site is located on internal drainage depression cut by gullies covered with dry half desert and steppe vegetation. Moisture is accumulated on the ravine bottom providing humidity during the whole year. Tillage lands and pastures are located along the periphery of the disposal site. Micro-relief and different gullies

orientation cause conditions for comparatively large variety of vegetation associations on the disposal site, on which birds and small mammalians have habitats and food in a year.

Brook and polluted ponds of the downstream of the disposal site are without fish, because they are not connected with main rivers.

Amphibians are represented by three types: green toad, lake frog and Siberia frog.

In terms of reptiles, representatives of this vertebrate class are more numerous and varied, if compared with amphibians on the disposal site. Central Asian turtle has been observed wintering on slopes of warmed clay gullies.

Representatives of scaly group also have been seen. One can meet: multi-colored and quick lizard, common grass-snake, patterned runner and ordinary mamushi (among poisonous snakes). Therefore, one type of turtle, two types of lizards and three types of snakes (one is poisonous) can be observed on the disposal site.

As for birds, representatives of this big class are the most numerous, movable and noticeable vertebrates on the disposal site. They can be observed in any season of the year there. Wild duck and gray-winged teal can be specified among lamellar beak shaped. They nestle and grow posterity in wet depressions and small brooks. One can see representatives of rails, i.e., moorhen and small spotted crake. Small plover, lapwing, and snipe also can be specified among sandpipers. Dove nestles near the disposal site or, probably, on its territory. Four types of valuable hunting commercial birds should be pointed out among chickens: quail, gray partridge, rock partridge and pheasant. Only quail is constantly observed among the four types there. The following birds of prey live there constantly: common kestrel and meadow harrier, but more than 20 types of day birds of prey (8 of them are under the Red Book of Kazakhstan and CIS) hunt during wintering and migration. Common cuckoo and representatives of Coraciiformes order, i.e., roller, gold be-eater, halcyon and hoopoe can be observed during nestling. Passerine group is represented more varied on the disposal site. Swallow, sand martin, skylark, crested lark, calandra lark, tawny pipit, blackcap wagtail, masket shrike, gray warbler, starling mynah, rook, magpie, jackdaw, black-headed bunting, reed-bunting, corn-bunting, tree sparrow, Spanish sparrow, Indian sparrow and domestic sparrow can be seen here.

A total of 36 types of mammalians referred to five groups have been registered at different times in Almaty suburbs and the town itself.

Long-eared hedgehog inhabits constantly the disposal site (among insectivorous); separate comings of small shrew are possible along humidity places from the northern slopes of Zailisky Alatau, the place of its habitat. More common is ordinary small shrew, typical for foothills zone timed to banks of different reservoirs with developed tree and grass vegetation and to waste ground covered with vegetation residues. This type let mice rodents (home mouse, Krygyz vole, forest mouse) be of larger quantity everywhere and be only of 1%, no more, of the total mice catching (B.B. Kasabekov, V.I Stogov, 1998).

The number of representatives of Chiroptera order is rather small and fly to the disposal site from nearby residential areas only to hunt. The most common for this zone are

sharp-cared moth, moustached moth, common noctule, and late bat, and during summer and spring-autumn migrations, northern bat and two-coloured bat.

Rodent group is most considerably represented on the disposal site. Yellow gopher inhabits the upper part of the disposal site on boundaries with cultured fields. Forest, field and domestic mice are spread all over the territory of the disposal site. Although gray rat has not yet been observed on the disposal site, that will be the item in the near future. Presence of common mole-rat, gray hamster and Kyrgyz field vole can be mentioned. Meetings with predators are possible: steppe or light polecat, badger and fox.

CHAPTER 3 RESULTS OF THE DATA COLLECTION ON SOCIO-ECONOMIC CONDITIONS OF THE SITE AND DATA ANALYSIS

3.1 DEMOGRAPHIC CONDITIONS

People numbering 151.8 thousand live in the Karasai region of Almaty Oblast, including children from 14 years (40.7 thousand) and up to 1 year (1.9 thousand). The main population is concentrated in Kaskelen City (center of the region located 4 km from the Karasai Disposal Site to the southeast). The population of Kaskelen City is presented in Table 3.1.1 below.

Table 3.1.1 Population of Kaskelen City

Parameters of Kaskelen	Year		
	1996	1997	1998
Total population including:	31,526	31,518	32,089
Men	9,677	9,323	8,863
Women	12,438	12,733	12,733
(Women of fertile age)	(7,544)	(7,812)	(7,812)
Children from 0 up to 14 years	9,411	9,462	10,493
(Children up to 1 year)	(460)	(481)	(499)

Note: According to the sanitary statistics adopted in Kazakhstan, the rate of diseases is calculated taking into account adults (men and women) from 14 years old and children (without sex distinction) up to 14 years.

Table 3.1.1 illustrates that the total population of Kaskelen City has the tendency to increase; for example, increase rate in terms of children is 4.5% between 1997 and 1996, and 3.7% between 1998 and 1997. As a whole, the rate is 8.4% during three years.

Data on natural movement of population is given in Table 3.1.2.

Table 3.1.2 Data on Dynamic Population Rate during 1966-1998 in Kaskelen City

Place	Quantity of born per 1000 of population			Quantity of died per 1000 of population			Natural growth per 1000 of population			Child's death (per 1000 born alive)		
	1966	1997	1998	1996	1997	1998	1996	1997	1998	1996	1997	1998
Kaskelen City	18.0	18.3	16.2	10.9	11.8	9.1	7.1	6.5	6.1	22.8	15.5	18.7
Average in: Almaty Oblast	16.2	14.6	14.3	9.0	8.8	8.7	7.2	5.8	5.6	20.8	19.5	15.2
Republic of Kazakhstan	15.9	14.7	14.2	10.4	10.1	9.8	5.5	4.6	4.4	25.4	24.2	21.4

According to Table 3.1.2, relative quantity of births per 1000 of population decreased; at 17% in 1998, in relation to 1997; at 15.6%, in relation to 1996. Negative dynamics of data is typical and for Almaty Oblast, as a whole.

Quantity of deaths was the largest in Kaskelen in 1997; this parameter decreased to 22.9% in 1998. However, it should be mentioned that as a whole mortality characteristics were higher in Kaskelen than those in Almaty Oblast.

Parameters of natural growth are of negative tendency in Kaskelen City and in Almaty Oblast (accordingly, 12.7% and 22.3% in 1998, if compared to 1996).

Children mortality rate is rather high in Kaskelen; it was 23% higher, in comparison with the Almaty City data in 1998, though it was lower than the Republic level.

3.2 PUBLIC HEALTH CONDITIONS

In 1998, there was a diminishing tendency of morbidity due to respiratory diseases among adults and children in Kaskelen City which is located 4 km from the Karasai Disposal Site to the South-East, as shown in Table 3.2.2. This parameter had actually diminished to one-third in 1997 in comparison with 1996 and continued to decrease to 13.2% in 1998.

The same picture of rate on respiratory diseases has been observed among children: 18.9 and 23.5%, accordingly.

Analysis of infectious disease expansion is of special significance in waste management problems. Earlier, high bacteria pollution of tanks and soils has been observed considerably in places of their location and transportation. There is a possibility to illustrate the rate of infectious diseases in Kaskelen region as a whole, in comparison with Almaty Oblast, Almaty City and the Republic.

Table 3.2.1 Characteristics of Rate of Infectious Disease

per 100 thousand of population

Location	Group of enteric infections		Dysentery		Other salmonella infection		Viral Hepatitis A		Tuberculosis of respiratory organs		Brucellosis	
	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998
Karasai	166.1	138.8	61.9	58.5	14.3	8.8	339.7	323.3	35.4	66.0	8.8	8.8
Almaty Oblast	172.7	143.8	45.3	44.8	12.4	7.3	281.3	249.8	47.9	78.6	32.8	30.3

Table 3.2.1 illustrates that levels of morbidity with dysentery, salmonella, and viral hepatitis A (through water) are higher in the Karasai region in comparison with the Oblast as a whole.

Growth of morbidity was observed at 34% with epidemic parotitis and 37.5% with tuberculoses; 1.2 times with echinococcus (from 25 up to 43 cases) and 1.2 times with ascariasis (from 239 up to 305 cases) during the first half of 1999 in the Oblast.

Table 3.2.2 Adult and Child Rates of Disease Depending on the Disease Classification (per 100 thousand people) in Kaskelen City

Rates	Kaskelen			Almaty			The Republic of Kazakhstan		
	1996	1997	1998	1996	1997	1998	1996	1997	1998
Respiratory diseases:									
Adults	46814.3	28939.9	24926.0	20702.6	13512.2	13756.5	11063.9	9919.4	9921.2
		-37.5	-46.8		-34.8	-33.6		-10.4	-10.4
			-13.9			+1.8			+0.02
Children	68643.1	57049.2	43634.3	36252.7	34702.5	40548.6	32469.1	31330.3	36856.8
		-16.9	-36.5		-4.3	+11.8		-3.5	+13.5
			-23.5			+16.8			+17.6
Allergic diseases:									
Adults	397.9	299.2	365.8	245.7	286.0	239.1	213.8	231.5	243.6
		-24.9	-8.1		+16.4	-2.7		+8.3	+13.9
			+22.3			-16.5			+5.2
Children	393.2	390.0	278.2	165.1	170.4	163.0	201.3	164.9	220.8
		-0.9	-29.3		-4.5	-1.2		-18.1	+9.7
			-28.7			-4.4			+33.9
Heart and vascular system diseases:									
Adults	19204.2	13878.3	13326.5	83323.0	8046.0	8753.5	1450.7	1383.9	1499.2
		-27.3	-30.6		-3.4	+5.0		-4.6	+3.3
			-4.0			8.8			+8.3
Children	212.5	253.6	143.9	580.2	610.1	736.8	241.2	248.9	337.3
		+19.3	-32.3		+5.1	+26.0		+3.2	+39.8
			-43.3			26.9			+35.5
Dermal diseases:									
Adults	3771.2	2947.0	1009.4	4579.5	4446.8	4395.0	-	3623.3	3593.4
		-21.8	-73.3		-2.9	-4.1		-	-
			-65.7			-1.2			-0.9
Children	3687.2	4988.3	1707.8	6456.5	5354.1	5398.2	-	4642.5	4676.0

		+35.3	-53.7 -65.8		-17.1	-16.4 +0.8		-	- +0.7
Renal diseases	4842.8	4810.5 -0.7	4542.5 -5.2 -5.6	5297.1	5335.4 +0.7	5740.0 +8.4 +7.6	2847.0	2863.6 +0.6	3012.1 +5.8 +52
Digestive tract diseases	28075.9	25530.5 -9.1	21028.1 -25.1 -17.7	7301.4	6278.4 -14.1	6776.3 -7.2 +7.93	3221.8	2659.6 -17.5	2873.8 -10.8 +8.1
Blood diseases	1017.4	1478.1 +45.3	1467.8 +44.3 -0.7	1692.4	1628.8 -3.8	2047.0 +20.9 +25.7	736.0	825.8 12.2	919.5 +24.9 +11.3
Oncologic diseases	3101.9	3232.7 +4.2	2958.9 -4.6 -8.5	1422.1	2473.5 +43.9	1424.8 +0.2 -42.4	379.6	389.3 +2.6	388.1 -0.4 -0.4
Virus hepatitis:									
Adults	384.3	453.4 +17.9	490.8 +27.7 +8.2						
Children	510.0	856.1 67.8	748.3 46.7 -8.5						

Note: «+» and «-» mean increase and decrease in rate of disease, respectively. The first line indicates the percentage in comparison with1996, and the second line indicates the percentage in comparison with 1997.

Table 3.2.3 Dynamics of Population Rate of Disease for 1996-1998 in Kaskelen and Almaty

Rate	Kaskelen				Almaty			
	1996	1997	1998	Increase, Decrease (+, -)%	1996	1997	1998	Increase, Decrease (+, -)%
General rate of disease	1305.0	1081.9	820.8	-37.1	776.2	743.9	794.6	+2.3
Rate of first time disease	786.2	708.9	457.1	-41.8	468.9	444.8	474.3	+1.15
Child rate of discase	1363.8	1116.5	786.2	-42.4	782.3	747.9	829.0	+5.9

The years 1999-2000 will be characterized by increase in rate of viral hepatitis A, which will increase twice and more, if compared with 1998, according to the Republic Sanitary Epidemiological Station. From 3.5 to 4.5 cases with hepatitis are annually registered per 100 thousand of population in the Oblast. Thus, 4,850 persons were ill in 1997, and 4,288 persons in 1998. Inconsiderable diminishing of morbidity were observed (1.6% and in 2.9 times, accordingly) in 1998 and the first half of 1999. Fifty-eight percent (58%) of schoolchildren were ill with hepatitis A, i.e., 27.1% of schools during the first half of the current year. High level of affected schools, 57.7%, has been specified in the Karasai region.

Increase in rate of enteric infection (II) diseases was observed during six months of the current year in 10 regions of the Oblast, including Karasai (1.7 times). Type II characteristic is 36.8 per 100 thousand of population there. Increase in rate of dysentery was observed 2.6 times in Karasai region. Twenty-six and a half (26.5) per 100 thousand of population in the region were ill with dysentery in the first half of the current year, while the Oblast level parameter is 10.8 per 100 thousand of population.

Growth of percentage of morbidity with dysentery was observed among the unemployed population and is equal to 28.9%.

In spite of general decrease in salmonella diseases, the epidemiological situation is serious. Increase in rate of diseases was also observed in the first half of the year in five regions, including Karasai. Morbidity prevails among adults (80-100%). The main way of transmission is food. This way has been revealed in 82.6% of cases in the Oblast and in 100% of cases in Karasai.

Respiratory diseases take a considerable place in the structure of infection morbidity, i.e., 86.7%. Morbidity with tuberculosis has grown from 563 up to 881 cases during the first half of 1999 (from 34.68 up to 54.1 per 100 thousand of population) including 1.6 times in the Karasai region.

The epidemiological situation of tuberculosis among children of up to 14 is considered to be unsatisfactory; these data have grown at 2.3 times in the Oblast and at 5.6 times in theKarasai region.

Among the main reasons of morbidity growth is social, and the way of transmission is contact or domestic.

Increase in rate of echinococcus diseases was observed at 1.72 times (from 1.49 up to 2.56 per 100 thousand). The main reason is decrease of control over butchering and burying of dead animals. There is no account of private dog degelmintisation.

3.3 HEALTH SERVICES

At the sanitary-protection zone of the disposal site there is no resident population, and the nearest residential area is located 3 km from the project site.

Medical care of specialists working at the project site is provided at the places where they live and, if necessary, by medical establishments of the Karasaisky. The main establishments are located in Kaskelen: medical establishments (Oblast Isolation Hospital), polyclinics and health centers. Sanitary-epidemiological care of population

and enterprises is provided by the local sanitary-epidemiological station. Currently, the first medical aid for the local population is provided by feldsher-obstetric stations. Specific diseases such as oncology, tuberculosis and others are treated at medical institutions in Almaty.

Personnel working at the disposal site are provided with medical care at their working places. The company "Parasat" stipulated in work documentation improvement of several activities, specifically, medical examination, immunization of persons working at water-retaining constructions, measures reducing traumatism, etc. First aid for disposal site personnel is provided by the specialists of the ambulance room located in the household zone.

3.4 Economic Situation

From the economic point of view, the area adjoining the Karasai Disposal Site is represented by highly productive spring-summer-autumn pastures used currently for sheep and goat pasture.

It should be mentioned that about half of tillage lands, mainly to the north of the disposal site, are currently not used, according to their assignment and turned to be cop and autumn-wormwood-cop grass deposits.

Evaluation of not irrigated tillage soil was performed on the investigated area under the oblast evaluation scale of tillage soils of not irrigated and irrigated husbandry approved by the Ministry of Agriculture of the Republic of Kazakhstan in 1978.

Calculation of quality of soil used for pastures has been performed, according to requirements of *"Collection of Temporary Methodical Instructions on Land Valuation in Kazakh SSR"*, 1979. As a result of soil evaluation, average quality index has been determined, which is equal to 31.7 for not irrigated tillage and 22.2 for pastures. Average evaluation is 26.2 on the investigated site.

Improvement of the Karasai Disposal Site was implemented on the area mentioned above without involving additional territories, so there is no need to calculate damage for land subtraction.

3.5 Land Use Conditions

The project on improvement of the Karasai Disposal Site will be implemented at the area occupied by the disposal site and use of additional areas is not stipulated. Land use conditions for this project will therefore be the same as for the currently operating disposal site. The questions on classification of land allocated for the construction of the disposal site and questions on compensation for loss of agricultural return were already decided during implementation of the project on Karasai Disposal Site operation. Consequently, repeated consideration of these questions in the process of the disposal site improvement is not required.