E1307

GENERAL DIRECTORATE OF ELECTRICITY GENERATION CORPORATION INC.

AFŞİN-ELBİSTAN A THERMAL POWER PLANT REHABILITATION AND CONSTRUCTION OF FLUE GAS DESULPHURIZATION UNIT PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

Kahramanmaraş Province, Afşin District

ÇINAR ENGINEERING CONSULTANCY AND PROJECT SERVICES LTD.

KEMA INTERNATIONAL B.V.

PROJECT OWNER	GENERAL DIRECTORATE OF EÜAŞ
Address	İnönü Bulvarı No: 27 06490 ANKARA TURKEY
Telephone and Fax Numbers	Tel: 0 (312) 212 69 00-15 Fax: 0 (312) 213 88 70
NAME OF THE ESTABLISHMENT/ STUDY TEAM PREPARING THE REPORT	Çınar Mühendislik Müşavirlik ve Proje Hizmetleri Ltd. Şti. & KEMA International B.V.
Address	Huzur Mah. 1.Cad. 53.Sok. Çınar Apt. No:6/3 06460 Öveçler-ANKARA TURKEY Ultrechtseweg 310 6812 AR Arnhem / NETHERLANDS
Telephone and Fax Numbers	Tel : +90 (312) 472 38 39 Fax: +90 (312) 472 39 33 Tel: +31 26 3 56 63 10 Fax: +31 26 3 89 24 77
NAME OF THE PROJECT	Afşin-Elbistan A Thermal Power Rehabilitation and Construction of Flue Gas Desulphurization Unit
DATE AND NUMBER OF THE COMPETENCY SERTIFICATE OF THE COMPANY WHO PREPARED THE REPORT	Date:04.03.2004 No:02

ABBREVIATIONS

AEATPP	Afşin-Elbistan A Thermal Power Plant
AEBTPP	Afşin-Elbistan B Thermal Power Plant
CEM	Continuous Emission Monitoring
CFB	Circulating Fluidized Bed
CO	Carbon oxide
CTD	Cooling Tower Discharge
ESP	Electrostatic Precipitator
EU	European Community
EÜAŞ	Electricity Generation Corporation Inc.
FGD	Flue-Gas Desulfurization
kWh	Kilowatt Hour
GLC	Ground Level Concentration
GoT	Government of Turkey
NGO	Non-Governmental Organizations
NO_x	Nitrogen Oxide
RIAPC	Regulation on Industrial Air Pollution Control
RAQP	Regulation on Air Quality Protection
RWPC	Regulation on Water Pollution Control
RSWC	Regulation on Solid Waste Control
RHWC	Regulation on Hazardous Waste Control
SO_2	Sulfur Dioxide
TEK	Turkey Electricity Establishment
TKİ	Turkish Coal Operation
USEPA	United States Environmental Protection Agency

CONTENTS LIST

TABLES LIST

FIGURES LIST

EXECUTIVE SUMMARY

OF

THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR

THE PROJECT OF REHABILITATION OF AFŞİN-ELBİSTAN A THERMAL POWER PLANT AND CONSTRUCTION OF FGD UNIT

1 Introduction

Within the framework of the "Preparation of Energy Liberalization Project" assisted by the World Bank, Republic of Turkey has applied a portion of a grant provided from Japan Policy and Human Resources Development (PHRD) fund for the procurement of the consultant services for the EIA study of the "Rehabilitation of Afşin-Elbistan A Thermal Power Plant and Construction of Flue Gas Desulfurization (FGD) Unit". The International Bank for Reconstruction and Development (IBRD) is the administrator of this grant.

Concerning the environmental assessment of the rehabilitation project, the project is classified as "Category A" by the World Bank and the Environmental Impact Assessment (EIA) procedure was applied. The EIA study and the procedure has also been carried out according to both requirements of the current EIA Regulation of Turkish Government (Official Gazette, No: 25318, 16.12.2003) and the Environmental Assessment Policies and Procedures of the World Bank (OP/BP/GP 4.01 Environmental Assessment). According to Turkish EIA Regulation, this project is included in Article 25 (b) that states extra ordinary conditions for EIA procedure to be applied to the projects which are not subjected to EIA Regulation officially, but subjected to international funding mechanisms. Therefore, a unique EIA Report had been prepared for both Turkish Legislation and World Bank Policies.

The chief objectives of the EIA were to: (a) determine if, based upon estimates of air quality impacts, the overall program for rehabilitation and FGD installation for the Afşin-Elbistan A Thermal Power Plant could be sequenced in time: first with a rehabilitation project (Phase I) to be followed by an FGD installation project (Phase II), if so, (b) determine impacts of the rehabilitation project and FGD project and necessary mitigating actions to determine if the FGD project (Phase II) could be derogated. The EIA work scope included a comparative analysis of air quality with respect to Turkish ambient air quality standards for SO_2 from current AETPP operation and resulting air quality after the Phase I rehabilitation is completed. Thus, the EIA served as a decision document for Turkish government officials to determine if the FGD investment was an immediate priority or could be developed at a later date.

This EIA study has been conducted by ÇINAR Mühendislik Müşavirlik ve Proje Hizmetleri Ltd. Şti. and KEMA International B.V. and this report has been prepared in accordance with the contract with EÜAŞ.

Aim of the EIA study is to meet both the requirements of the Turkish EIA Legislation and World Bank for a “Category A” Environmental Assessment study (OP 4.01 Annex B Content of an EA Category A Report). For this purpose, EIA has been prepared according to the special EIA format regarding the requirements of the World Bank and Turkish Ministry of Environment and Forestry

This EIA was prepared using both field surveys and desktop studies (literature survey, calculation, assessments and modeling).

1.1 Major Conclusions

The EIA procedure yielded the following major conclusions:

- The rehabilitation of the ESPs on the main stack and the Bruden stacks is essential to address the dust and particulate emission problems.
- The AEAPP operating at full load after rehabilitation/upgrade without an FGD unit will meet both the Turkish long-term and short-term *air quality standards* for SO_2.
- In evaluating the EIA, the Ministry of Environment and Forestry (MOEF) has recognized that plant performance after rehabilitation will still comply with Turkish air quality standards for SO_2 in the plant vicinity, although the Turkish SO_2 emission limit values are not being met and therefore, has confirmed that it will provide a derogation period in which to install an FGD in accordance with an Amendment to the "Regulation on Control of Air Pollution Caused by Industrial Sources" (RCAP) to be issued shortly.
- The rehabilitation of the plant will improve the plant's environmental compliance with Turkish dust emission standards. Dust emissions have been identified, during public consultations as a major environmental issue among local groups.

2 Project Description

Afşin-Elbistan A Thermal Power Plant (AEATPP) is located between Çoğulhan and Alemdar Towns of Afşin District of Kahramanmaraş Province. It was established by TEK during 1984-1987. It has 1355 MWe capacity with its four units and it is one of the most important power plants in Turkey.

AEATPP is a conventional thermal power plant utilizing low quality lignite from Kışlaköy Region. Lignite is sent to the storage area by conveyors having a capacity of 1 million tons. Lignite extracted from the different layers of the mine (having several calorific values) is blended here and the lignite that has 1050 kcal/kg average value is conveyed to the power plant. The power plant consumes 3000 ton fuel per hour.

Steam temperature and pressure in the boiler are 535°C and 197.5 kg/cm^2 respectively and each boiler produces 1020 ton/h steam. Voltage is 21 kV at the outlet of generator that is then amplified to 380 kV in order to connect energy to the grid.

Process water is supplied from Ceyhan River Spring in Elbistan. Ash produced is conveyed back to open mining site by ash conveyors and filled to the vacancies formed by extraction of coal. These areas are then covered by topsoil and landscaped.

The plant was designed to burn the low quality lignite with high moisture easily without using supplementary fuel. The system developed for such lignites is to first dry the lignite to increase its calorific value.

AEATPP is designed for an annual electricity production of 8.800.000.000 kWh. However, there have been a loss/decrease in capacity and reliability of the plant due to equipment wear and some unscheduled shutdowns. Average efficiency has decreased below the design efficiency. Therefore, General Directorate of Electricity Generation Corporation (EUAŞ) decided that the rehabilitation of the plant is required.

Afşin-Elbistan A Thermal Power Plant Rehabilitation and FGD Project will be sequenced into two phases: the first phase includes rehabilitation of the plant and the second phase will be construction of a Flue Gas Desulfurization (FGD) plant.

The first phase of the program to be financed by the World Bank is rehabilitation of AEATPP. The rehabilitation is mainly focused on the rehabilitation of the plant and the rehabilitation of electrostatic precipitators,

The efficiency of the electrostatic precipitators will be improved, in order to comply with the Turkish PM_{10} standard, 100 mg/Nm^3.

Scope of the rehabilitation of the plant comprises the following items.

Boiler and Boiler Auxiliaries

It will include necessary maintenance, modernization and rehabilitation studies such as, replacement of boiler tubes in order to prevent tube leaks, eliminatination of slagging problems, making the sootblowers functional to reduce fouling on the heating surfaces, rehabilitation of fuel-oil burners, increasing the performances of the vapor electro-filters.

Turbine and Turbine Auxillaries

Necessary maintenance, modernization and rehabilitation studies will be carried out such as, rehabilitation or replacement of the automatic by-pass system heater and condensate drainage and discharge systems, switching the control system to digital system, rehabilitation of heaters, renewing or rehabilitation of pumps and related control system, making the on-line observation equipments for chemical parameters functional, and elimination of coating problems. .

Other Installations

It will include maintenance, modernization and rehabilitation studies in some other installations such as, making the automatic coal sampling functional, modernization of old type circuit breakers, improvement of cathodic protection line, taken the neutralization pit outside the water treatment plant.

In the second phase, the FGD unit to be retrofitted to AEATPP will be similar to FGD unit in the AEBTPP, and based on wet limestone process, with a 95% reduction efficiency approximately.

3 Purpose Of The Project

The aims of the World Bank project for AEATPP are as follows:

- Improvement of plant reliability/availability,
- Improvement of the efficiency of the plant,
- Extension of the operating life of the plant, and

- Reduction of dust emission levels to fulfill Turkish Environmental Regulations.

3.1 Importance and Necessity of the Project

The energy-environment review carried out by the World Bank and the Government of Turkey (GoT) concluded that rehabilitation of existing power plants is economically and environmentally justified. The GoT has identified rehabilitation of all existing thermal power plants and retrofitting FGD units during the next five years as a high priority of its energy strategy. Afşin-Elbistan A Power Plant is at the top of the rehabilitation list because it has experienced the most significant deterioration in its performance and reliability. Coupled with the need to improve its environmental performance, rehabilitation is the most cost effective option.

The GoT has also recognized that retrofitting FGD systems on all their thermal power stations is required both to improve environmental performance in the energy sector and as one of the conditions of the EU Acquis for the energy sector.

The derogation for a reasonable transition period is required to make necessary investments to achieve the Turkish emission standards. As it is known, Turkey is a candidate country for EU membership and the studies have been carried out for the harmonization of EU environmental legislation-including the EU Large Combustion Plants (LCP) Directive. It is expected that the EU will grant derogations for Turkey's existing thermal power plants, since the EU has provided such derogations for both its' newer members such as Poland and for candidate members such as Romania

Within this context, the Ministry of Energy and Natural Resources (MENR) have been informed about the legislative situation of these thermal power plants to achieve the emission limit values specified in the Regulation on Industrial Air Pollution Control and necessity of the derogation providing a transition period for PM_{10} and SO_2 emissions. MENR has requested from the Ministry of Environment and Forestry (MoEF) provision of derogation for a transition period to achieve the SO_2 emission limit values for the existing lignite-fired power plants and the undersecretary level meetings have been carried out. Within the high-level negotiations, MENR and MoEF agreed on the importance of the derogation. MENR has recently received an official letter from MoEF related to the draft derogation item for providing the 5 year-transition period to meet the emission limits given in the Regulation. Within this framework, the amendment of the Regulation covering the derogation is expected soon. In case of obtaining the derogation, it will be possible to realize the rehabilitation of Afşin-Elbistan A Power Plant without the construction of FGD plant at the first stage and to construct the FGD system on the second stage at the point in time specified in the derogation.

3.1.1 Improvement of Environmental Performance

The Turkish Air Quality Legislation could be summarized in two different Regulations. Regulation on Air Quality Protection states the short term and long term ground level concentration limits to be observed in a defined impact area. The Regulation on Industrial Air Pollution Control defines the limits for stack gas emissions for various industries. In this section the focus will be emissions levels specified in the above Regulation.

The main air pollutants of the power plant, which require further control, are particulates and sulfur dioxide (SO_2). NOx-emissions are in the 400-500 mg/Nm^3 range, which is in compliance with the Turkish Environmental Regulations.

Air quality modelling results show that the plant will comply with Turkish air quality standards after rehabilitation.

SO_2 stack emission levels are 2,000 to 15,000 mg/Nm^3 depending on the sulfur content of the coal while the regulatory stack gas SO_2 emission limit value in Turkey is 1000 mg/Nm^3. Therefore an FGD unit will be required as part of the second phase of the program.

Main goals of the project are to improve reliability and efficiency of the AEATPP and extend life of the plant to ensure security of energy supply and consequently decrease emissions of the plant below the limits of Regulation on Industrial Air Pollution Control and to decrease negative impacts on environment.

The total investment for the rehabilitation project is estimated to be approximately 440 million USD, and the FGD retrofit system is about 220 million USD.

4 Location of The Project

Afşin-Elbistan A Thermal Power Plant is located within the Kahramanmaraş Province of Turkey. Location of AEATPP is 14 km far from Afşin District and 30 km from Elbistan District. The nearest settlement place to the AEATPP is Çogulhan Town.

AEATPP is located to the 2.5 km east of existing AEBTPP. Location of power plant is 154 km north of Kahramanmaraş City.

Project will affect primarily Çoğulhan Town, Afşin District, and Kahramanmaraş Province.

5 Baseline Environmental Characteristics of the Project Area

In this section the Baseline environmental characteristic data that were obtained as a result of literature and field surveys. The baseline environmental measurement results will be presented in the following sections.

5.1 Meteorological Characteristics

Afşin District is located at the intersection of Mediterranean, Central Anatolia and Eastern Anatolia. Although the terrestrial climate dominates, characteristics of these three regions could be observed in this region. Dry and arid weather dominates in the summer while cold and snowy weather dominates in the winter. Most of the rains are formed during spring and autumn.

5.2 Geology and Geomorphological Characteristics

There are no special geological and geomorphological features and no negative effect of the activity on the geology.

5.3 Surface and Ground waters

The Elbistan and Göksun plains are groundwater catchment areas around the project area. The direction of groundwater flow in the project area is from northwest and northeast to south towards Hurman Creek. The largest river in the project area is Hurman Creek.

5.4 Soil Characteristics

Soils of the region mainly composed of Alluvial, Colluvial, Brown and Red Brown Soils. Most of the soils have heavy, neutral, less alkaline structure and very rich in lime. Soil of the region has no problem in view of permeability and salinity.

Afşin District, where AEATPP is located, is approximately 41% agricultural fields, 39% meadow and pasture lands, 9% forest, 10% others and 1% residential areas.

AEATPP is located on, alluvial, colluvial and forest soil group and the capability class of the soil is Class I. Erosion degree is "less erosion".

The soil of the region, where AEATPP is located, has very high lime content and alkaline structure. Therefore they have low acidification sensitivity.

The existing soil sample analysis and literature study shows that the soils of the region and agricultural areas have alkaline character. Therefore, soils of the region show the ability to neutralize SO_2 deposition.

It is observed during the site surveys around the AEATPP that fly ash from the power plant deposits on the ground, especially in Çoğulhan Town, which is the nearest settlement to the power plant. During the public meeting, local farmers stated that the agricultural products have been affected by the dust emitted from the AEATPP

Farmers of the region interviewed by EIA group experts indicated that there has been a difference in vegetable production compared to before and after commencement of power plant's activity, also, drying of the plants was observed. In addition, most of the complaints were focused on settleable dust problem. These statements are based on farmers own opinions and observations. However, there is no scientific study or statistical data justifying complaints or observations.

5.5 Water Resources and Usage

The main water sources of Afşin and Elbistan Districts are Hurman stream, which is a branch of Ceyhan River, Göksun Stream and Mağara Gözü Stream. There has been irrigated agriculture in the plain side. Hurman stream, passing through the Afşin Plain, is the most important stream of Afşin District. Ceyhan River springs from the Pınarbaşı Locality, which is located in 3 km east of Elbistan.

The drinking water of Afşin District is supplied from Çobanpınarı Spring. This spring is 5 km west of Afşin District and 22 km far from AEATPP. Drinking and potable water source of Elbistan District is Ceyhan Spring that is southeast of the Elbistan District. The flow rate of the Ceyhan Spring is 5-7 m^3/s. Based on information from Elbistan Municipality, existing water supply of the Municipality is 0.35 m^3/s and the future demand will be about 0.6 m^3/s. After second phase of the project, AEATPP will require 1.5 m^3/s water. Therefore, water supply of the AEATPP will not have a drawback. The drinking water demands of Çoğulhan and Alemdar Towns are supplied by drinking water network that uses groundwater sources.

5.6 Flora and Fauna

As a result of the rehabilitation project, the settleable dust emissions from the Afşin-Elbistan A Thermal Power Plant (AEATPP) will decrease below the limit values of Regulation on Industrial Air Pollution Control. This will have a positive impact on the terrestrial flora of project impact area.

The project impact area does not constitute a special living and breeding habitat for the fauna species. Planned project will be realized in the existing power plant area; therefore there will not be any habitat loss for the fauna species. By the rehabilitation of power plant and construction of FGD unit, the ambient air quality will increase and that will have a positive impact on terrestrial fauna indirectly.

5.7 Lignite Sources

Afşin-Elbistan lignite reserve located in Kahramanmaraş covers an area of almost 100 km^2 in Afşin and Elbistan Districts. This region has proven ore deposits of 3.4 billion tones. Reserve is on the economical open mining facility, considering the 3/1 m^3/ton stripping ratio about 1.7 billion tons of this total reserve is economic. The reserve under consideration is used as three sectors named Çöllolar, Kışlaköy and Afşin sectors. The coal has been used in Afşin-Elbistan Thermal Power Plants.

6 Baseline Environmental Studies Conducted in the Region

Site surveys have been conducted to determine existing baseline environmental conditions for Afsin-Elbistan A Thermal Power Plant Rehabilitation Project area and its close vicinity between 2nd of February and 5th of April 2005. These environmental surveys covered the noise measurements, surface and groundwater sampling, air quality survey and soil pollution sampling.

The scope of the work conducted in this region is the determination of the existing pollution level of the area. The air quality monitoring was conducted during two 60 day periods for a total duration of approximately four months while the other sampling and monitoring works were only conducted ~~for~~ once. In addition to those studies there were no other previous baseline studies conducted in the region. Therefore, there were no previous data showing the environmental situation of the region before the power plant was put into operation and hence it is not possible to compare the existing situation with the previous one, so that the exact level of impact of the power plant on the environmental conditions of the area could not be determined. The findings of the analysis could only be compared and discussed with the regulations and with each other.

6.1 Noise Measurements

Noise survey was conducted between 4th and 13th of February 2005. Purpose of the survey is to collect the baseline data regarding the background noise levels in the vicinity of the Afşin-Elbistan A Thermal Power Plant. For this purpose 12 hours continuous noise measurements were conducted at totally 7 points.

Baseline noise measurement results were compared with the World Bank standards and standards stated in Turkish Regulation on Assessment and Management of Environmental Noise.

The L_{eq} values measured around the Afşin Elbistan A Thermal Power Plant were in compliance with the maximum allowable values given by Turkish Regulation on Assessment and Management of Environmental Noise and the World Bank Limits.

6.2 Surface and Groundwater Sampling Studies

Water samples were taken from groundwater wells and surface water to determine the baseline physical and chemical characteristics of the water resources of the Project site within the context of surface and groundwater quality survey on 15th of February 2005.

Surface and ground water samples were taken around the Afşin-Elbistan A Thermal Power Plant at totally 6 points which are expected to be affected from project activities. Two of the wells were selected around the ash deposit area to determine the characteristics of the groundwater according to the parameters stated at "Regulation on Hazardous Waste" Annex11-A Table.

Samples were analyzed to determine the water classification for pH, DO, Conductivity, TDS, Total Hardness, COD, BOD, NO_3, NO_3-N, F, Cl, CN, Zn, Cu, Fe, SO_4, PO_4-P, Mg, As. Samples taken from ash deposit area were also analyzed according to the parameters stated at the Table of Regulation on Hazardous Waste Control Regulation Annex11-A. Quality of the water resources is determined incompliance with the Regulation on Water Pollution Control. Most of the parameters for the surface and groundwater samples show Class 1 and 2 properties. According to the Regulation, Class 1 is the highest quality water and the Class 2 is the slightly polluted water that are both explained in Section 3.2.9.2 of EIA Report.

The water samples taken at two boreholes in the ash deposit area were analyzed according to the Regulation on Turkish Hazardous Waste Control Annex11 A. Parameters analyzed in ground water samples taken from the ash deposit area are below the limit values of hazardous waste. So that the existing facilities does not have a negative influence on the existing water quality of the surrounding water sources.

6.3 Baseline Soil Contamination Survey

Baseline soil contamination survey was conducted in February 2005. The focus of this survey was the collection and subsequent analysis of the soil samples from the thermal power plant and its surrounding to determine the baseline soil conditions. Totally 10 soil samples were taken for the soil efficiency analysis (texture, salinity, pH, lime, phosphorus, potassium, organic matter), cation exchange capacity and chemical analysis (TOC, Total Nitrogen). 2 of the soil samples were taken from the ash deposit area to be analyzed according to the parameters stated at Regulation on Hazardous Waste Control Annex 11 A.

6.4 Baseline Air Quality Survey

Baseline air quality measurements were conducted for Afsin-Elbistan A Thermal Power Plant rehabilitation area and its close vicinity between 2nd of February and 5th of April 2005 and between 18th of May and 17th of July 2005 to establish current levels of air quality and to calibrate the air quality model that would subsequently be used to estimate the change of air quality due to the activities for the Afşin-Elbistan A Thermal Power Plant Rehabilitation Project. Measurements were conducted at 10 locations. 2 measurements were performed at the dominant wind directions on the nearest sensitive receptors to the Afşin-Elbistan A Thermal Power Plant along the long term dominant wind directions, and remaining 8 measurements were conducted at locations in project impact area as specified in Turkish Regulation on Industrial Air Pollution Control (Item 40 a-1). During each monitoring period, at each location, three samples were taken, each representing a twenty day average.

The overall measurement results for 120 days were compared with the long term (LT) limit values stated in the Regulation on Air Quality Protection Article 6. The definition of ST limit value is stated in the regulation as the value that should not be exceeded by the 95% of all the measurement results of the daily average values. Since only twenty day averages were available with the diffusion tube measurements, the ST or daily average values were estimated by air quality modeling. The ISCST3 model developed by the USEPA and which has been adopted as the international standard for multiple point sources modeling of air quality impacts from tall stack emissions was used to estimate ST values of air quality parameters (dust, SO_2, and NO_X). The definition of LT is stated in the regulation as the value that should not be exceeded by the arithmetical average of all measurement results. The ST limit values stated in the regulation are the daily average values that should not be exceeded 95 per cent of the year.

The pollutants that were the focus of this air quality survey are PM_{10}, HF, HCl, NOx and SO_2. Fractions of the suspended particulate matters with aerodynamic diameters less than 10 micrometers (PM_{10}) are of main concern because of their strong correlation with human health effects. In this survey, existing ambient PM_{10} levels were surveyed at ten sampling points in the vicinity of the existing Afşin-Elbistan A Thermal Power Plant. On the other hand settleable particulate matter having higher aerodynamic diameters, have importance for visual nuisance and plant life since these particulates cover the leaves of the plants and inhibits the photosynthesis.

Particulate matter (PM), NO_x and SO_2 are three of the primary air pollutants of combustion. Therefore at ten sampling points in the vicinity of the existing Afşin-Elbistan A Thermal Power Plant site also were selected for NO_X and SO_2 analysis. The passive diffusion tubes were used for these pollutants. Ten sampling points in the vicinity of the existing Afşin-Elbistan A Thermal Power Plant site were also selected for HF and HCl analysis.

In addition the existence of particulate matter problem around Afşin-Elbistan A Thermal Power Plant is obvious with the field observations. The particulate matter is classified as settleable (large particulates) and PM_{10}. The measurements were based on the measurement of PM_{10} since it has a health hazard risk. This measurement results should be accepted as a reference for future.

Measured nitrogen oxide concentrations were below the long term limit values.

SO_2 was first measured at 10 sampling points around Afşin-Elbistan A Thermal Power Plant between 2nd of February and 5th of April 2005. Second phase SO_2 measurement was conducted at the same sampling points around Afşin-Elbistan A Thermal Power Plant between 18th of May and 17th of July 2005. Slight decrease was observed in SO_2 concentrations during the last period measurements. Afşin Elbistan A Thermal Power Plant was not operated between 3rd and 13th of July 2005 according to the capacity report which may explain the difference.

As a result of the air quality modelling analysis conducted, and the results of the ambient SO_2 measurements, it is determined that indicate that the Afsin-Elbistan A Thermal Power Plant as it currently operates (at reduced capacity) and after it will be rehabilitated and operated at full capacity are in compliance with the Turkish ST and LT air quality standards. First phase air quality measurements conducted during the winter period (February, March and early April), second phase air quality measurements conducted during spring-summer period (May, June and July) and the results of continuous SO_2 measurement station of EÜAŞ reflecting reduced capacity operation of the plant show that both the short term and long term SO_2 concentrations are in compliance with the regulation. Furthermore, the modeling results for the plant operating at full capacity after rehabilitation will also indicate that the plant will be in compliance with Turkish air quality regulations.

7 Construction Period Environmental Impacts and The Mitigation Measures

7.1 Emissions

The rehabilitation project (first phase) will involve removal and/or replacement of obsolete plant components. Land preparation, excavation and construction works will be involved for the second phase of the project for the foundation of FGD unit. The material excavated during land preparation will be used as fill material and the excess material will be carried to internal storage area by the trucks.

The main source of emissions to the atmosphere during construction is dust. Emissions during the construction of a building can be associated with land clearing, drilling and blasting, ground excavation, cut and fill operations and construction of a particular facility itself. Dust emissions often vary substantially from day to day, depending on the level of activity, the specific operations, and the prevailing meteorological conditions. A large portion of the emissions can also results from equipment traffic over temporary roads at the construction site.

Potential impacts associated with dust emissions during the land preparation and the construction phase will be minimized by the following mitigation methods;

- Stockpiles of material will be done in such a manner so as not expose them to wind by covering them with suitable sheet material.
- The access road will be water sprinkled to prevent dust formation.
- Particular attention will be paid to dust suppression on the working width or at construction sites when working within dry weather conditions.
- Vehicles delivering dusty construction materials to the site or removing spoil will be limited at speed and covered.

The excavation works during construction of the project will be conducted in accordance with "Regulation on Excavation Soil, Construction and Ruins Control" published by 18.03.2004 dated and 25406 numbered Official Gazette.

Total emission amount from the working machines were calculated and the emission value is below the 1.5 kg/h limit value stated by Article 40 of Regulation on Industrial Air Pollution Control. The vehicles will regularly be maintained and the vehicles will not be left running unless needed.

7.2 Water and Wastewater

During the construction works of the project, water will be consumed for domestic purposes and water spraying for dust prevention. Water demand of the AEATPP is currently supplied from Ceyhan River Spring. During the rehabilitation of AEATPP and the construction of FGD unit, required water will also be supplied from the same source.

During the construction activities at the first and second phase of the project, the chief source of wastewater will be from domestic wastewater of the workers. The wastewater produced will be conveyed to existing domestic wastewater treatment plant of the power plant. The capacity of the treatment plant will meet the wastewater load of the personnel during construction phase as the plant was designed for operation phase of the power plant.

7.3 Solid Wastes

Solid wastes generated during the construction activities will include domestic solid wastes from the personnel, medical wastes, and oily wastes, hazardous wastes such as used batteries, bitumen, cables, copper, fire-fighting foam, adhesives, general chemicals, acids, oil rags and absorbents, solvents, contaminated soils, insulation, paint sludge, used oil and paint cans and drums etc. and package wastes.

Domestic wastes will be collected at black bags separated from medical, hazardous dangerous and package wastes. Separately collected domestic wastes will be transported to temporary waste storage center or container by special vehicles and they will be stored separately. Domestic wastes will not be mixed with any hazardous waste and/or medical waste during the collection.

All operations related with storage, transportation and disposal of domestic solid wastes will be carried out in accordance with “Regulation on Solid Waste Control” published on 14.03.1991 dated and 20814 numbered Official Gazette.

For the existing situation, solid wastes of AEATPP are taken by private firm for disposal. Solid wastes produced during the construction works will also be disposed by the same company.

Waste collection containers will be located in the project area. Recyclable wastes (paper, plastic etc.) and irreversible organic wastes (food wastes) will be stored in different closed containers.

Paper, cardboards, plastics and metal package wastes will be segregated according to their type and collected by blue bags. Collection, transportation, storage and disposal of package wastes will be in accordance with Regulation on Package and Packaging Wastes issued on 30.07.2004 dated and 25538 numbered Official Gazette.

If any hazardous waste including heavy metals and chemical wastes is formed during the construction phase, storage and disposal of these wastes will be conducted in compliance with Regulation on Hazardous Control Regulation issued on 14.03.2005 dated and 25755 numbered Official Gazette.

Regulation on Waste Batteries and Accumulators Control came into force by 31.08.2004 dated and 25569 numbered Official Gazette will be complied.

The medical wastes produced at the medical center of the power plant will be collected at red bags and containers and they will be disposed in compliance with Regulation on Medical Waste Control.

Waste oil will be disposed in compliance with Regulation on Waste Oil Control came into force by 21.01.2004 dated and 25353 numbered Official Gazette.

7.4 Noise

During the construction of both phases of the project noise is expected from trucks, dozer, mixer, excavator, compressor, and grader. The potential for noise will be minimized by restricting construction works to those hours permitted by the relevant working hours.

The noises from the vehicles used for the construction will not exceed the standard noise levels and the limits of Regulation on Assessment and Management of Environmental Noise will be met.

According to the calculations, noise level is below 70 dBA at 150 m distance from the construction site. Nearest residential area is located 600 m far away from the AEATPP location therefore noise levels would not expected to be excessive to have negative impact on the community.

The Contractor will supply the personnel protective equipment such as ear guards.

Personnel employed for the construction works will be accommodated in the existing guesthouse of the power plant, Çoğulhan Town and/or houses in the Afşin District. Therefore whole technical/social infrastructure needs of the personnel working for the construction activities will be supplied from AEATPP, Çoğulhan Town and /or Afşin District.

7.5 Health and Safety

During the construction phase of the project, the risks posed to human health are possible industrial accidents resulting from the construction works requiring use of heavy construction equipment.

In order to minimize these risks,

- Qualified personnel will be employed for the construction equipments and all personnel will be trained for health and safety issues,
- Working shift of workers for construction activities will be limited, ,
- Personnel protection equipment such as eyeglasses, gloves, hard heads and safety belts will be supplied,
- Personnel will be monitored to assure they use protection equipment.
- Continuous health center will be established on project area and health centre and health staff will be ready for the incidents on site,
- The measures will be taken for fire fighting.

Work Health and Safety Regulation came into force by 09.12.2003 date and 25311 numbered Official Gazette and Worker Health and Worker Safety Rule will be complied.

8 Environmental Impacts during Operation Phase of the Project and Necessary Mitigation Measures

8.1 Water Consumption

All of the water required for process (feed water, cooling water and domestic water) demand of AEATPP is supplied from Ceyhan Spring in Elbistan. Water is pumped to the power plant by four pumps each has 1800 m^3/h capacity and two steel pipelines have been used for this purpose. Each line has 1 meter diameter and 30 km length. Incoming water is demineralized before it is used in the process.

Maximum water consumption of the AEATPP is about 4300 t/h. Raw water line currently feeding the AEATPP has a capacity of 7200 m^3/h and the current maximum demand of AEATPP is 4300 t/h. When the FGD is retrofitted at AEATPP it will require 1000 t/h water supply. Therefore, the current source, namely Ceyhan Spring is enough for both the water demand of process and FGD of AEATPP.

8.2 Wastewater

In AEATPP, some of the wastewater is reused and some part is discharged. The wastewater to be discharged is treated at sewage or ash water treatment plants and then discharged to Çoğulhan River in compliance with discharge standards.

8.3 Air Quality Impacts and Air Quality Dispersion Modeling

The stack gas emission report of TUBITAK-MAM prepared at the year 2000, for SO_2 and PM concentrations of the power plant were used to estimate the source strength.

The calculations are carried out with a US-EPA regulatory model ISCST3 that is a well known model and is the standard for most international studies. It is a satisfactory model for dispersion calculations. The model is especially designed for tall stacks.

For the purpose of this project the short term version has been applied, since hour-by-hour meteorology data is available and it is generally recognized that detailed modeling with hour-by-hour meteorology will result in more precise calculations. It is especially suitable for the Afsin-Elbistan A Thermal Power Plant. The model accepts hourly meteorological data records to define the conditions for plume rise, transport, diffusion, and deposition. The model estimates the concentration or deposition value for each source and receptor combination for each hour of input meteorology, and calculates both yearly averaged and short term (daily) averages.

Long term average values calculated by the model are average concentrations calculated over separate atmospheric classes and averaged over at least one year. Since the one year period might not be considered to be representative, 3 years period is used in modeling studies.

For the dispersion of the emissions from power plant, modeling was applied for both the existing situation of the power plant and 3 different scenarios. First case is according to the existing situation of power plant, second case is the no FGD and PM emissions are limited to 100 mg/Nm^3 by ESPs, Third case is the FGD option and 100 mg/ Nm^3 PM concentration, the fourth case is FGD option an 50 mg/Nm^3 PM concentration is limited by ESP. For each case, the contribution of AEBTPP was also taken into account.

Dispersion calculations are carried out, using the following elements:

- emission data,
- surface parameters,
- meteorological data, and
- dispersion model.

Hourly observations of three years data were used to calculate the daily and annual average concentrations for existing and future situation around power plant.

8.3.1 Modeling Results for Existing Situation Scenario

For the existing situation, the capacity factor of the power plant was taken as 40% in the modelling studies.

8.3.1.1. SO_2

1.49% of the model results of over 1,840,695 result (365 days x 1681 grid points x 3 years) exceed the 400 μg/m^3. Therefore there is no violation with Turkish short term air quality standard that is 5% of the results should not exceed 400 μg/m^3. In addition, both the short term air quality standard (<5 per cent of the daily average values to exceed 400 μg/m^3) and the long term annual average air quality characteristics are also in compliance with Turkish air quality standards at residential areas within the impact area of the project.

8.3.1.2. NOx

The maximum annual average concentration and maximum daily average concentration values calculated by the model are in compliance with the Turkish Regulation.

8.3.1.3. PM_{10}

1.71% of the model results of over 1.840.695 result (365 days x1681 grid points x 3 years) exceed the 300 μg/m^3. Therefore there is no violation with Turkish short term air quality standard that is 5% of the results should not exceed 300 μg/m^3. Annual average air quality characteristics are also in compliance at residential areas within the impact area of the project.

8.3.2 Rehabilitation Scenarios

8.3.2.1. Base scenario

The base scenario is the rehabilitation of the power plant without FGD. ESPs will be installed in this option. All of the stacks of the power plant will operate, PM_{10} emission will be reduced to 100 mg/Nm^3. Ambient PM_{10} and SO_2 levels will generally be in compliance with the ST and LT limits of the Turkish Regulation.

8.3.2.2. Alternative 1 with FGD

In this scenario a FGD is installed and will reduce the SO_2 emission concentration so it complies with 1000mg/Nm^3 which is the stack gas emission limit value of Turkish Regulation. The dust (PM_{10}) emission will be reduced to 100mg/Nm^3. All ST and LT ground levels of PM_{10} and SO_2 concentration calculation values comply with Turkish air quality limits.

8.3.2.3. Alternative 2 with FGD

In this scenario a FGD is installed and will reduce the SO_2 emission concentration to 1000mg/Nm^3. The dust emission concentration will be reduced to 50mg/Nm^3. In this alternative there is no difference in the ground level SO_2 contribution. The stack gas dust (PM_{10}) concentration will be reduced by a factor of two compared to Alternative 1 with FGD.

8.3.3 Discussion of the Results of Dispersion Calculations

Using the ISCST3 model, the dispersion calculations was carried out for SO_2, PM_{10} and NO_x.

For PM_{10}, NO_x and SO_2 there are both long term and short term averaged limit values given in Turkish Regulation were checked.

For existing case, base scenario and the alternatives with FGD, average annual (long term) and short term (daily) air quality characteristics in Afşin-Elbistan area for residential centers are in compliance with the long term air quality limits.

As a result of the modeling scenarios, it was determined that without an FGD, after the rehabilitation, operation of the Afsin-Elbistan A Thermal Power Plant would comply with Turkish Ambient Air Quality Regulation.

8.4 Ash and Gypsum Disposal

Ash and slag produced by combustion in the power plant have been carried by ash transportation system. Ash is first removed by the ESPs and then it is conveyed to mining area by ash conveyors and buried there by filling the empty area caused by the coal extraction.

The ashes of AEATPP were analyzed according to parameters of Regulation on Hazardous Waste Control Annex 11-A and it was observed that ash is not in the hazardous waste classification stated in the regulation in force.

At the second phase of the project, the gypsum from FGD unit will be mixed with ash and then the mixture will be conveyed to the disposal at the mining area. Amount of gypsum produced will be about 5,750 millions ton per year including sludge and ash. The water amount in the gypsum will supply the moisture needs of the mixture to be conveyed. The disposal of the mixture will be the same as the method stated above. Recycling of the gypsum is not possible in this region. Ash and gypsum mixture will be disposed at the mining area. Gypsum and waste ash from the power plant will be watered to prevent blowing.

The ashes of existing AEATPP were analyzed by Middle East Technical University Environmental Engineering Department according to parameters of Regulation on Hazardous Waste Control Annex 11-A and the results are presented in the report of "Research Project of Middle East Technical University on Storage of Thermal Power Plants Ashes of TEAŞ According to the Regulation on Hazardous Waste Control (Project Code No: 98.03.11.28)". The results were compared with the Regulation on Hazardous Waste Control Annex 11-A and all parameters between the limit values and or in the defined range, therefore the ashes can be land filled.

The cover of the disposal site will be afforested as current condition.

8.5 Other Solid Wastes

Disposal of sludge produced from wastewater treatment plant will be carried out according to the Regulation on Solid Waste Control and regulation on Soil Pollution Control dated 31.05.2005.

Domestic solid wastes will also be produced during the operation period of the AEATPP. Existing domestic waste production rate of power plant is 146,000 kg per year. Solid wastes are collected by a private firm and they are disposed. After the first and second phases of the project, same procedure will continue, no change in the amount of solid waste is expected and the disposal method will remain the same if no additional employment will be necessary.

8.6 Noise

Noise originates from workplace sites with high-powered equipment such as the steam turbine, generator, and substations. The noise from these sources may exceed 85 decibel acoustic (dBA) in the production area. The personnel working at these places should use ear protection equipment. The impact of noise will be negligible beyond 500 m from the site.

8.7 Soil Acidification

General sensitivity classification of soil properties shows that soil samples of the project area are not sensitive to acid deposition. Furthermore, sensivity to alkaline cation loss, sensivity to dissolved "Al" and general sensivity is "L" Category (low sensivity).

In conclusion, the project will not expected to have a negative impact on regional soil quality.

8.8 Impacts of the Project on Existing Agricultural Areas and Agricultural Products

Within the scope of the first phase, rehabilitation project, of AEATPP, the electrofilters will be rehabilitated and ash will not be discharged on the soil and agricultural areas.

In addition to that, at the second phase of the project FGD unit will be installed and the FGD retrofit will decrease the ground level concentration of SO_2 emissions below the limits of the Turkish Regulation.

8.9 Impacts on Groundwater and Surface Water and Mitigation Measures

Both sewage and ash water treatment plant will be in use during the operation of the AEATPP. Therefore there will not be any discharge from the plant to the receiving water bodies without treatment. Discharge parameters will be in compliance with the limits of Water Pollution Control Regulation published on Official Gazette dated 31st of December 2004 and numbered 25687.

At the second phase of the project, gypsum produced at the FGD unit will be disposed by discharging into the mining area where lignite is recovered completely. Low solubility of ash and gypsum decreases the pollution risk. Dissolution and negative effect on groundwater is not expected. Since the gypsum sludge is alkaline it tends to immobilize heavy metals, preventing their leaching and subsequent migration to groundwater.

Groundwater quality around the AEATPP will be monitored regularly during the operation of the project.

8.10 Occupational Health and Safety

One of the expected health effects of the existing plant is the air pollution level resulting from the power plant. Results of stack gas measurements conducted by TÜBİTAK MAM in 2000 show that dust and SO_2 emissions exceeds the limits of Regulation on Air Pollution Control due to the failure ESP and lack of FGD unit. Therefore EUAS has planned the rehabilitation of AEATPP and FGD retrofit.

Emissions will be under the limits of the Regulation on Industrial Air Pollution Control currently in use.

Industrial accidents may be another risk that is normally seen at all industrial plants. Personnel will be trained on Occupational Health and Safety Rules in order to guarantee safety at plant. Details are given by EMP in the Annex 1A of the EIA report.

Waste management will properly be applied in the plant. All wastes will be collected and disposed in accordance with Regulation on Water Pollution Control, Regulation on Industrial Air Pollution Control, Regulation on Hazardous Wastes Control and Regulation on Hazardous Chemicals.

Medical wastes produced from medical center of power plant will be disposed in compliance with the Regulation on Medical Waste Control published by Official Gazette dated 20.05.1993 and numbered 21586.

Fire fighting system will always be present, tested and in service in the plant.

9 Environmental Management Plant (EMP)

An Environmental Management Plan reflecting the main environmental issues to be addressed in both Phase I (Rehabilitation) and Phase II (FGD installation) of the program has been prepared.

EMP establishes a framework for the identification of environmental protection, mitigation, monitoring measures to be taken during both construction and operation phase of the project. EMP consists of mainly seven chapters, as Project Description, Mitigation Plan, Monitoring Plan, Institutional Strengthening, Schedule, Institutional Arrangements and Public Consultation.

EMP clearly indicates the environmental monitoring to be applied during the both first and second phases of the project.

10 Public Meetings and Disclosure

Public meeting for the project was held in Çoğulhan Town, which is the nearest settlement to AEATPP, in 17th of March 2005. Participants of the meeting were local people, Mayors of Çoğulhan Town, Afşin District, Elbistan District, NGOs from Kahramanmaraş, authorities from A and B Power Plants, media, Regional Chamber of Agriculture representatives, representatives of Ministry of Environment and Forest, representatives of Kahramanmaraş Provincial Directorate of Environment and Forest, representatives from General Directorate of EÜAŞ, and representatives of EIA Consultants, Çınar Engineering. Date of the meeting was determined by the Ministry of Environment and Forestry. Place of the meeting was determined by Kahramanmaraş Provincial Organization of Environment and Forestry.

Public meeting was announced to the people by the following methods ten days before the meeting:

- Announcement in a national gazette,
- Announcement in the local gazette in Afşin and Elbistan Districts,
- Announcement on website of Çınar Engineering (www.cinarmuhendislik.com),
- Announcement at Afşin, Elbistan Districts Municipalities,
- Announcement at the Provincial Organization of Kahramanmaraş Environment and Forestry for informing their official directorates, NGOs and media,
- Announcement of the public directly from the office of ÇINAR rented in Çoğulhan for a duration of one month and the public opinion on the project were obtained by written complaints at this office.
- Distribution of brochures before meeting.

During the meeting a power point presentation was given to the public for explanation of the phases of the project and existing situation with photographs.

The complaints of the public on the existing emissions from the plant, was especially focused on dust deposition. Health problem and damage on agricultural products are also mentioned by the participants and local residents. Another subject they mentioned is the employment. Recruitment at the both AEATPP and AEBTPP is their common request.

The draft EIA report was made available for the public and NGOs at the Municipalities of Çoğulhan Town, Afşin and Elbistan Districts, Kahramanmaraş Provincial Directorate of Environment and Forestry , Management offices of AEATPP and AEBTPP and the contact office of ÇINAR in Çoğulhan. Availability of draft EIA report for review of interested parties for duration of 15 days starting from the 15^{th} of August 2005 was announced by Kahramanmaraş Provincial Directorate of Environment and Forestry and local newspapers. Both Turkish and English summary of the EIA Report was also announced to people at the web site of Çınar Mühendislik Müşavirlik ve Proje Hizmetleri Ltd.Şti. (www.cinarmuhendislik.com).

The comments of the public and NGO's on the draft EIA and their statements at public meeting were incorporated in the EIA Report. A general complaint of the public is the air pollutant emissions of the existing power plant. People believe that the rehabilitation project and FGD installation project on the second stage will decrease the emissions from the power plant and they present their thanks to EÜAŞ.

The copies of EIA Report were distributed to the official institutions after the EIA Report was accepted by the Ministry of Environment and Forestry as a final document.

11 Impacts of the Project on Socio-Economic Environment and Environmental Cost Benefit Analysis

As it is stated in the report, the failures caused decrease in the production capacity of the AEATPP. Its production is very low compared to its design capacity. The rehabilitation is inevitable because AEATPP has very important role in the economical use of the lignite reserves and reverse as energy in Afşin-Elbistan Region and this power plant is the first power plant of the region. The rehabilitation will decrease the production cost.

Environmental performance of the existing power plant has also been decreased due to the failures in the plant especially on ESPs. PM and SO_2 emissions of the power plant exceeds the limit values of Regulation on Industrial Air Pollution Control. By this project, ESP rehabilitation and FGD retrofit will provide lower emissions; SO_2 and PM concentrations will decrease the emission limit values of the regulation. Therefore, negative impacts on human health, agricultural products and other living organisms will be minimized.

12 Project Alternatives

Rehabilitation of the existing power plant on the first phase and construction of FGD unit on the second phase has no other alternative.

At the second phase, the most appropriate areas will be preferred for the location of FGD unit and its buildings. From the technological point of view, the planned system for the FGD, is wet-limestone process which is the most efficient system.

13 Conclusion

Main goals of the Project are to improve reliability and efficiency of the AEATPP and extend the life of the plant and to decrease emissions of the plant below the limits of Regulation on Industrial Air Pollution Control.

Rehabilitation of AEATPP at the first phase and installation of FGD unit at the second phase will guarantee reliability and efficiency of the plant, it will also extend the life of the plant and it will increase environmental performance of the plant which is one of the most important power plants of Turkey.

CHAPTER I: DEFINITION AND PURPOSE OF THE PROJECT

(Definition, lifetime, and means of service of the project, the importance and necessity of the project from the economical point of view, cost-benefit analysis of the project)

Definition of the Project

Afşin-Elbistan A Thermal Power Plant (AEATPP), located between Çoğulhan and Alemdar Towns of Afşin District of Kahramanmaraş Province and established by TEK during 1984-1987, has 1355 MWe capacity with its four units and one of the most important power plants in Turkey. Installed capacities and operation dates of the power plant are as follows.

Unit 1: 340 MWe, 07.07.1984

Unit 2: 340 MWe, 23.05.1984

Unit 3: 340 MWe, 25.01.1986

Unit 4: 335 MWe, 21.11.1987

AEATPP is designed for an annual electricity production of 8,800,000,000 kWh. However, there has been a loss/decrease in capacity and reliability of the plant due to the equipment wear and some unscheduled shutdowns. Average efficiency has decreased below the design efficiency. Therefore, General Directorate of Electricity Generation Corporation (EUAŞ) decided that the rehabilitation of the plant is required for the prevention of the generation losses, replacement of the worn or non-functional parts and modernization of some parts.

Afşin-Elbistan A Thermal Power Plant Rehabilitation and FGD Project will be sequenced into two phases: the first phase includes rehabilitation of the plant and the second phase will be construction of a Flue Gas Desulfurization (FGD) plant.

The first phase of the program to be financed by the World Bank is rehabilitation of AEATPP. It will include maintenance, repair, rehabilitation and modernization of mainly boiler, turbine accessories, ESPs, coal and ash systems, electrical systems, control and monitoring system. In the second phase, the FGD unit to be retrofitted to AEATPP will be similar to FGD unit in the AEBTPP, and based on wet limestone process.

FGD unit that will be established as retrofit in the second stage of the project will be similar to the FGD unit in the AEBTPP, and based on wet limestone process. For the planned project, flue gas discharge from cooling tower after treatment and collected at one system is proposed.

Purpose of the Project

The aims of World Bank project for AEATPP are as follows:

- Improvement of plant reliability/availability
- Improvement of the efficiency of the plant
- Extension of the operating life of the plant, and

- Reduction of dust emission levels to fulfill Turkish Environmental Regulations

Importance, Necessity of the Project and Cost-Benefit Analysis of the Project

Coal has an important role to play in meeting Turkey's rapidly growing demand for energy. However, at the same time, there is considerable concern about the environmental impact of burning fossil fuels that is one of the most important energy sources for Turkey. Coal contributes for nearly 25% of the total primary energy production. The lignite consumption in electrical energy is about 15%. In contrast, hard coal accounted for only some 2% of the power generation fuel-supply. According to this, the ratio of the coal in electrical energy is about 15.6%. Lignite reserves in Turkey amount to more than 8.3 billion tones and are spread throughout the country. The biggest lignite deposits, 40% of total identified resources, are in the Afşin-Elbistan region. Lignite is extracted from the quarries of both TKI and EÜAŞ in Turkey and the annual total coal consumption is about 52 million ton. There is a small but growing private sector that supplies local power plant.

Turkish lignites are characterized by high ash and sulfur and a low caloric value which ranges from less than 4 MJ up to 17 MJ/kg. However, approximately 66% of the reserves range between 4-8 MJ/kg. Lignite will continue to be used primarily by mine-mouth power plants designed to handle such low quality coal, from the points of view of both reliability and environmental impact.

The energy-environment review carried out by the World Bank and the Government of Turkey (GoT) concluded that rehabilitation of existing power plants is economically and environmentally justified. The GoT has identified rehabilitation of all existing thermal power plants and retrofitting FGD units during the next five years as a high priority of its energy strategy. Afşin-Elbistan A Power Plant is at the top of the rehabilitation list because it has experienced the most significant deterioration in its performance and reliability. Coupled with the need to improve its environmental performance, rehabilitation is the most cost effective option.

Following table shows key operating statistics of the plant.

Table I.1 Key Operating Statistics of the Plant for the Period 1998-2003

YEAR	GENERATION	CAPACITY FACTOR	EQUIVALENT AVAILABILITY	AVAILABILITY	PLANT EFFICIENCY	HEAT RATE (NET)	COAL CONSUMPTION	COAL CALORIFIC VALUE
	(kWh)	(%)	(%)	(%)	(%)	kCal/kWh	(Ton)	kCal/kg
1998	7,693,310,000	63.82	70.40	76.86	31.30	2.748	16,855,568	1,239
1999	7,689,660,000	63.79	74.47	79.19	30.76	2.796	17,130,000	1,241
2000	4,731,890,000	39.61	43.77	50.30	30.06	2.861	10,970,167	1,218
2001	5,234,080,000	43.93	46.48	52.86	30.40	2.829	12,290,128	1,193
2002	2,887,300,000	24.32	31.05	34.72	28.96	2.970	7,141,993	1,184
2003	3,081,190,000	25.96	36.48	41.28	28.92	2.974	7,319,037	1,228

Source: Turkey Assessment of Afşin-Elbistan Rehabilitation Final Report, Chubu Electric Power Co. Inc., August 10, 2004.

Operating Data Review

While the design data were reviewed for all loads, including full load, the focus of the evaluation (see table below) focuses on approximately 80% load because this was the typical operating output presently. Actual data was obtained during the site visit of the Project Team on 25th of February, 2004. The bold numbers in the actual data column indicate parameters, which deviated significantly from the design values. More specifically, and in addition to the turbine, boiler and plant efficiencies:

- Reheat spray is 40 tons/h vs. 16.5 tons/h which is the design value
- Stack gas temperature is 223°C vs. 160°C which is the design value
- Excess air measured by excess oxygen in the economizer outlet is 10.6% vs. the design value of 4.4%.
- All these have a significant adverse impact on plant efficiency.

Table I.2. Operational Data Comparison

Unit 3	Design (80% Load)	Actual Feb. 25, 04
Output (MWnet)	275	280
Gross Unit Efficiency (%)	36.5	**29.4**
Total Turbine Efficiency (%)	44.3	**40.6**
HP Turbine Efficiency (%)	89.1	**82.8**
Boiler Efficiency (%)	83.3	**72.6**
Main Steam		
Pressure (kg/cm^2)	156.4	150
Temperature (degree)	530	530
Flow Rate (Ton/hr)	805	**850**
Superheater Spray Flow Rate (Ton/h)	80	75
Reheat Steam		
Pressure (kg/cm^2)	31.7	34
Temperature (degree)	530	533
Flow Rate (Ton/h)	739	NA
Reheater Spray Flow Rate (Ton/hr)	16.5	**40**
Cold Reheat Steam		
Pressure (kg/cm^2)	35.4	34
Temperature (degree)	318.5	**330**
Flow Rate (Ton/hr)	723	NA
Condenser		
Vacuum (abs kPa)	5.9	**9.2**
Hot Well Temperature (degree)	35.7	**44**
Make Up Water		
Temperature (degree)	NA	5
Flow Rate (Ton/h)	NA	**15-25**
Circulating Water		
Inlet Temperature (degree)	22	20
Outlet Temperature (degree)	33.3	33
Flow Rate (Ton/hr)	24,410	**31,360**

Unit 3		Design (80% Load)	Actual Feb. 25, 04
Boiler Feed Water			
Pressure (kg/cm^2)		220	177
Temperature (degree)		242	170
Flow Rate (Ton/h)		805	**870**
Boiler Feed Water Composition at ECO			
pH		9-9.2	9.2
Conductivity (uS/ cm)		< 4	2,8
Silicon (ppb)		< 20	10
Dissolved Oxygen (mg/liter)		NA	NA
Copper (ppb)		< 5	12
Iron (ppb)		< 20	10
Air Heater			
Temperature (°C) Gas in / Gas out		370/160	373/**223**
Air in / Air out		NA	12/305
Actual Concentration of O_2 in flue gas (vol %) ECO out / AH out		4.4/5.7	**10.6**/NA
Fuel Composition			
Lignite Composition (w%)	Carbon	NA	18.35
	Hydrogen	NA	1.46
	Oxygen &Nitrogen	NA	7.97
	Sulfur	NA	1.46
	Ash	NA	19.15
	Moisture	NA	52.30
Calorific value L.H.V (kcal/kg)		1050	1346

Source: Turkey Assessment of Afşin-Elbistan Rehabilitation Final Report, Chubu Electric Power Co. Inc., August 10, 2004.

Availability of the units of AEATPP has been reduced significantly from 70-80% to 30-40%, the decline is severe nevertheless and reflects deteriorating plant reliability.

Plant efficiency has declined by approximately 2.3 percentage points since 1998 (28.90% vs and 31.30%) and 7.7 percentage points below design value (36.6%). Also, the units (even though designed for 344 MWnet output) cannot produce more than an average of 305 MWnet and some units have been limited to even lower level.

The GoT has also recognized that retrofitting FGD systems on all their thermal power stations is required both to improve environmental performance in the energy sector and as one of the conditions of the EU Acquis for the energy sector.

The limit values for SO_2 emissions given in the Regulation on Industrial Air Pollution Control cannot be achieved in some of the existing thermal power plants and the construction of FGD system is required. In spite of this requirement, these thermal power plants, including Afşin-Elbistan A Power Plant, could not be retrofitted with the FGD system because of the substantial investment requirements. These plants are very important to provide the security of energy supply and they are in operation although the requirements of the Environmental Legislation can not be met.

Therefore, the derogation for a reasonable transition period is required to make necessary investments. As it is known, Turkey is a candidate for EU membership and the studies have been carried out for the harmonization of EU environmental legislation including the EU Large Combustion Plants (LCP) Directive. It is expected that the EU will grant Turkey derogations for its' existing thermal power plants, since the EU has provided such derogations for both its' newer members such as Poland and for candidate members such as Romania.

Within this context, the Ministry of Energy and Natural Resources (MENR) have been informed about the legislative situation of these thermal power plants to achieve the emission limit values specified in the Regulation on Industrial Air Pollution Control and necessity of the derogation providing a transition period for PM and SO_2 emissions up to 2010 and 2015, respectively. MENR has requested from the Ministry of Environment and Forestry (MoEF) provision of derogation for a transition period to achieve the SO_2 emission limit values for the existing lignite-fired power plants and the undersecretary level meetings have been carried out. Within the high-level negotiations, MENR and MoEF agreed on the importance of the derogation. MENR has recently received an official letter from MoEF related to the draft derogation item for providing the 5 year-transition period to meet the emission limit values on the condition that to achieve the air quality standards given in the Regulation on Protection of Air Quality. Within this framework, the amendment of the Regulation covering the derogation is expected. In case of obtaining derogation, it will be possible to realize the rehabilitation Afşin-Elbistan A Power Plant at the first phase and to construct the FGD system on the second phase, at the point in time specified in the derogation.

Furthermore, emissions are above Turkey's environmental standards, and control of particulates and sulfur dioxide (SO_2) are needed. Particulates are in the 420-8,000 mg/Nm^3 range (dry basis corrected for 6% O_2), significantly above the 100 mg/Nm^3 required by Turkish environmental regulations. SO_2 emissions range from 2,000 to 15,000 mg/Nm^3 depending on the sulfur content of the coal. Flue gas desulfurization (FGD) systems are needed to reduce SO_2 emissions below 1000 mg/Nm^3.

Improvement of Environmental Performance

The Turkish Air Quality Legislation could be summarized in two different Regulations such as Regulation on Air Quality Protection which states the short term and long term ground level concentration limits to be observed in a defined impact area and secondly The Regulation on Industrial Air Pollution Control that defines the limits for stack gas emissions for various industries. In this section the focus will be emissions levels specified in the above Regulation.

The main air pollutants of the power plant, which require further control, are particulates and sulfur dioxide (SO_2). NOx-emissions are in the 400-500 mg/Nm^3 range, which is in compliance with the Turkish Environmental Regulations.

Particulates from the Bruden filters are in the 1,200-8,000 mg/Nm^3 range while the electrostatic precipitators (ESPs) downstream of the boiler have similar performance (420 mg/Nm^3 to 6,000 mg/Nm^3) which is above the current regulatory limit value of 100 mg/Nm^3. Bruden (vapor) filters are used to separate vapor and coal dust. The moisture content in the coal is evaporated by flue gas heating process in the mills. After mills, 1/3 of coal dust together with 2/3 of gas leaving mills goes to the bruden filters where coal dust is collected and fed to the boiler and steam is exhausted to the atmosphere by vapor fans.

SO_2 is not controlled resulting in stack emission levels of 2,000 to 15,000 mg/Nm^3 depending on the sulfur content of the coal where the regulatory stack gas SO_2 emission limit value in Turkey is 1000 mg/Nm^3. Therefore an FGD unit will be required as part of the second phase of the program.

Main goals of the project are to improve reliability and efficiency of the AEATPP and extend life of the plant to ensure security of energy supply and consequently decrease emissions of the plant below the limits of Regulation on Industrial Air Pollution Control and to decrease negative impacts on environment.

The total investment for the rehabilitation project is estimated to be approximately 440 million USD and the FGD retrofit system is about 220 million USD.

Cost-Benefit Analysis

Rehabilitation of AEATPP is cost-effective, as one of the low-cost producing stations in Turkey. Its production costs, 1.5-1.7 cents/kWh when the plant capacity factor is high, are consistent with the other lignite-fired plants (e.g., Seyitömer and Yatağan) and they are the lowest in Turkey's power system. Production costs of competing natural gas-fired power plants have averaged at 3.6-4.1 cents/kWh. AEATPP rehabilitation is a part of Turkey's least-cost development plan.

Main Assumptions

- Discount rate: 10%
- Capacity factor: 60% without the rehabilitation and 75% with rehabilitation
- Recovery of plant output from 305 MWnet to 344 MWnet for each unit
- Displacement power cost: 3.878 cents/kWh
- Production cost without rehabilitation: 1.499 cents/kWh
- Production cost after rehabilitation: 0.941 cents/kWh

Also, a number of sensitivity analyses were performed to assess the impact of certain parameters, which possess some uncertainty in the cost-effectiveness of the project. The results in case that capacity factor with rehabilitation varies are summarized below.

Table I.3. Sensivity Analysis in case of Parameter of Capacity Factor

Capacity Factor (%)	Production Cost (Cents/kWh)	Net Present Values (USM$)	Internal Rate of Return (%)	Payback period (yrs)
65	1.238	96.57	13.78	8
70	0.977	397.74	24.05	5
75	0.941	566.56	29.47	4

Source: Turkey Assessment of Afşin-Elbistan Rehabilitation Final Report, Chubu Electric Power Co. Inc., August 10, 2004.

The above Table demonstrates that, if following rehabilitation, AEATPP units can sustain more than around 70% capacity factor, the rehabilitation project has an internal rate of return above 20%.

The total investment of the rehabilitation project is estimated to be approximately 440 million USD, and the FGD retrofit system is about 220 million USD.

Environmental Impact Assessment of the Project

Within the framework of the "Preparation of Energy Liberalization Project" assisted by the World Bank, Republic of Turkey has applied a portion of a grant provided from Japan Policy and Human Resources Development (PHRD) fund for the procurement of the consultant services for the EIA study of the "Rehabilitation of Afşin-Elbistan A Thermal Power Plant and Construction of Flue Gas Desulfurization (FGD) Unit". The International Bank for Reconstruction and Development (IBRD) is the administrator of this grant.

Concerning the environmental assessment of the rehabilitation project, the project is classified as "Category A" by the World Bank and the Environmental Impact Assessment (EIA) procedure was applied. The EIA study and the procedure has also been carried out according to both requirements of the current EIA Regulation of Turkish Government (Official Gazette, No: 25318, 16.12.2003) and the Environmental Assessment Policies and Procedures of the World Bank (OP/BP/GP 4.01 Environmental Assessment). According to Turkish EIA Regulation, this project is included in Article 25 b that states extra ordinary conditions for EIA procedure to be applied to the projects which are not subjected to EIA Regulation officially, but subjected to international funding mechanisms. Therefore, a unique EIA Report had been prepared for both Turkish Legislation and World Bank Policies.

The chief objectives of the EIA were to (a) to determine if, based upon estimates of air quality impacts, the overall program for rehabilitation and FGD installation for the Afşin-Elbistan A Thermal Power Plant could be sequenced in time: first with a rehabilitation project (phase I) to be followed by an FGD installation project (phase II), if so, (b) determine impacts of the rehabilitation project and FGD project and necessary mitigating actions. To determine if the FGD project (phase II) could be derogated, the EIA work scope included a comparative analysis of air quality with respect to Turkish ambient air quality standards for SO_2 from current AETPP operation and resulting air quality after the phase I rehabilitation is completed. Thus the EIA served as a decision document for Turkish government officials to determine if the FGD investment was an immediate priority or could be developed at a later date.

EIA Team

The EIA study has been conducted by ÇINAR Mühendislik Müşavirlik ve Proje Hizmetleri Ltd. Şti. and KEMA International B.V. and this report has been prepared in accordance with the contract with EÜAŞ.

Aim of the EIA study is to meet both the requirements of the Turkish EIA Legislation and World Bank for a Category "A" Environmental Assessment study (OP 4.01 Annex B

Content of an EA Category A Report). For this purpose, EIA has been prepared according to the special EIA format regarding the requirements of the World Bank and Turkish Ministry of Environment and Forestry.

EIA Approach

This EIA was prepared using both field survey and desktop study (literature survey, calculation, assessments and modeling).

Aim of the study is the preparation of the EIA report for the project to analyze all environmental impacts of the project including impacts on air and water quality, water use requirements, waste water and solid waste disposal, etc. as well as cumulative impacts associated with the full operation of both Afsin-Elbistan units A and B.

Within the scope above, general aim of EIA is as stated below:

- to gather information on the existing environment
- to identify environmental constraints and opportunities associated with the area which may be affected by the project;
- to identify and assess potential environmental impacts which may arise during both the construction and operation of the project,
- to outline measures and/or design criteria to mitigate potential concerns or impacts.

Method

Environmental information was obtained through site visits, surveys, consultation with interested parties and a review of existing Turkish legislation and other literature. The surveys included in-situ and laboratory analysis of existing environmental components such as water, air, noise and soil.

This information was used to:

- provide details of baseline environmental conditions present on the site and within the surrounding area;
- identify the potential causes of environmental impact, and;
- assess the impacts on environmental resources and sensitivities, taking account of mitigation measures to be incorporated into the design process.

Assessment Criteria

The prediction of impact used a range of techniques, including:

- those specified in Turkish legislation and standards;
- guidelines, standards and regulations of World Bank;
- acceptable environmental software;
- comparative analysis, and;
- professional judgment.

The assessment of impact significance was based on a combination of magnitude, duration of impact, and value and sensitivity of the receiving environment. Assessments are based on related Turkish and/or World Bank Standards.

CHAPTER II: LOCATION OF THE PLACE SELECTED FOR THE PROJECT

(Representation of the location of the project on existing landuse map, representative pictures of the project area)

Afşin-Elbistan A Thermal Power Plant is located within the Kahramanmaraş Province of Turkey. Location of AEATPP is 14 km far from Afşin District and 30 km from Elbistan District. The nearest settlement places to the AEATPP is Çogulhan Town, 500 meter from the plant, and Alemdar Town that is about 1 km far from the power plant.

Site map of the AEATPP is given in Figure II.1 and topographical maps are given in Figure II.2 and Figure II.3.

AEATPP is located at 2.5 km east of existing AEBTPP. Location of power plant is 154 km north of Kahramanmaraş City.

Whole site of AEATPP is about 222,982 m^2. Location of AEATPP is in the Afşin-Elbistan Plain and the elevation of this area is between 1100 and 1300 meter.

Pictures from the existing condition of AEATPP are given by Figure II.4 and II.5.

Table II.1. Distances of the Settlement Places to the AETPP

Settlement Place	Distance from AEATPP (m)
Çoğulhan	500
Alemdar	1500
Afşin	14000
Tanır	11800
Altınelma	12600
Bakraç	9000
Çobanbeyli	10000
Kışlaköy	6900
Kalaycık	8600
Büget	9100
Tarlacık	5700
Çomudüz	5200
İnciköy	9100
Kangal	8600
Yazıbelen	6500
Karagöz	8500
Kuşkayası	6500

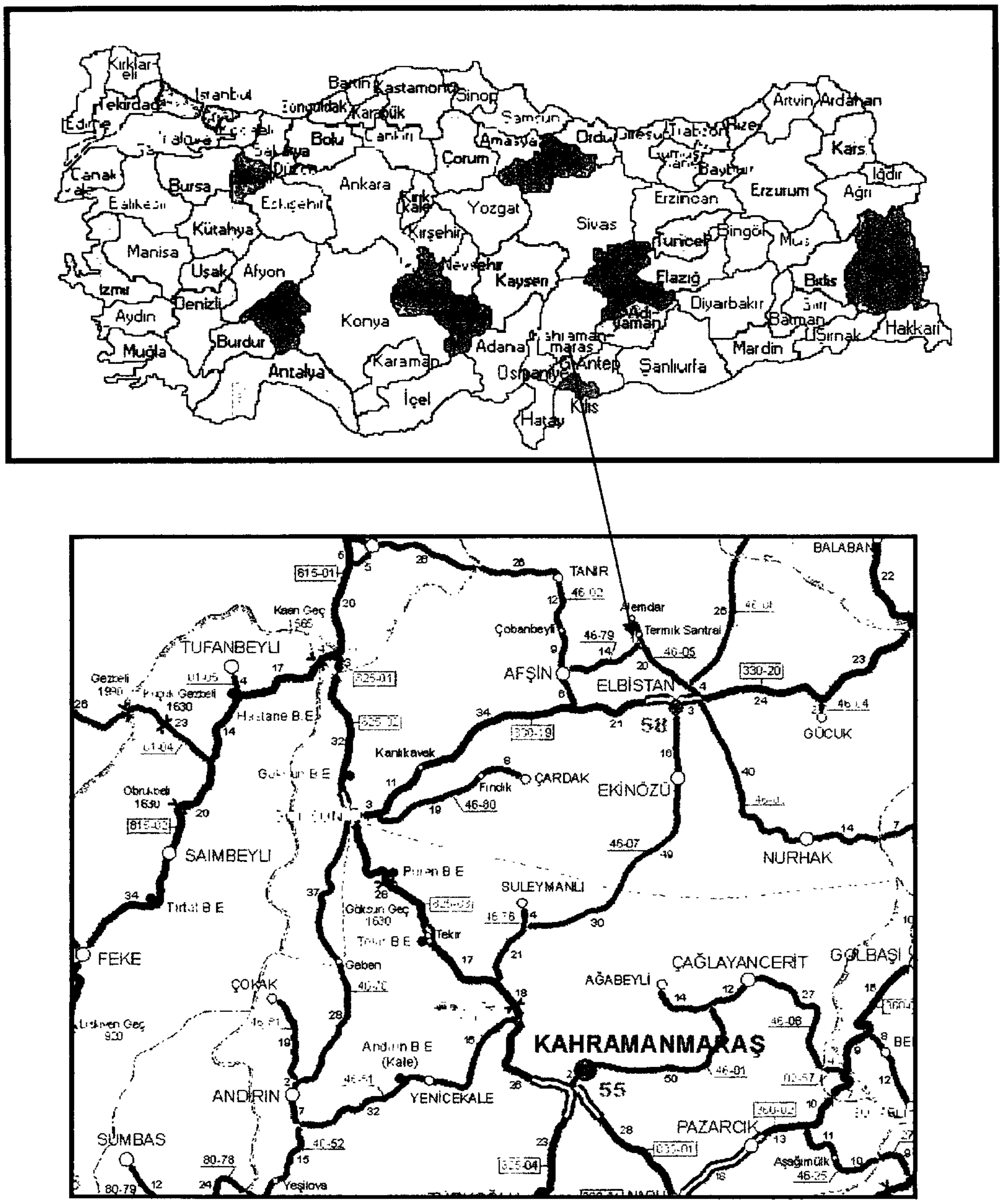


Figure II.1. Site Map

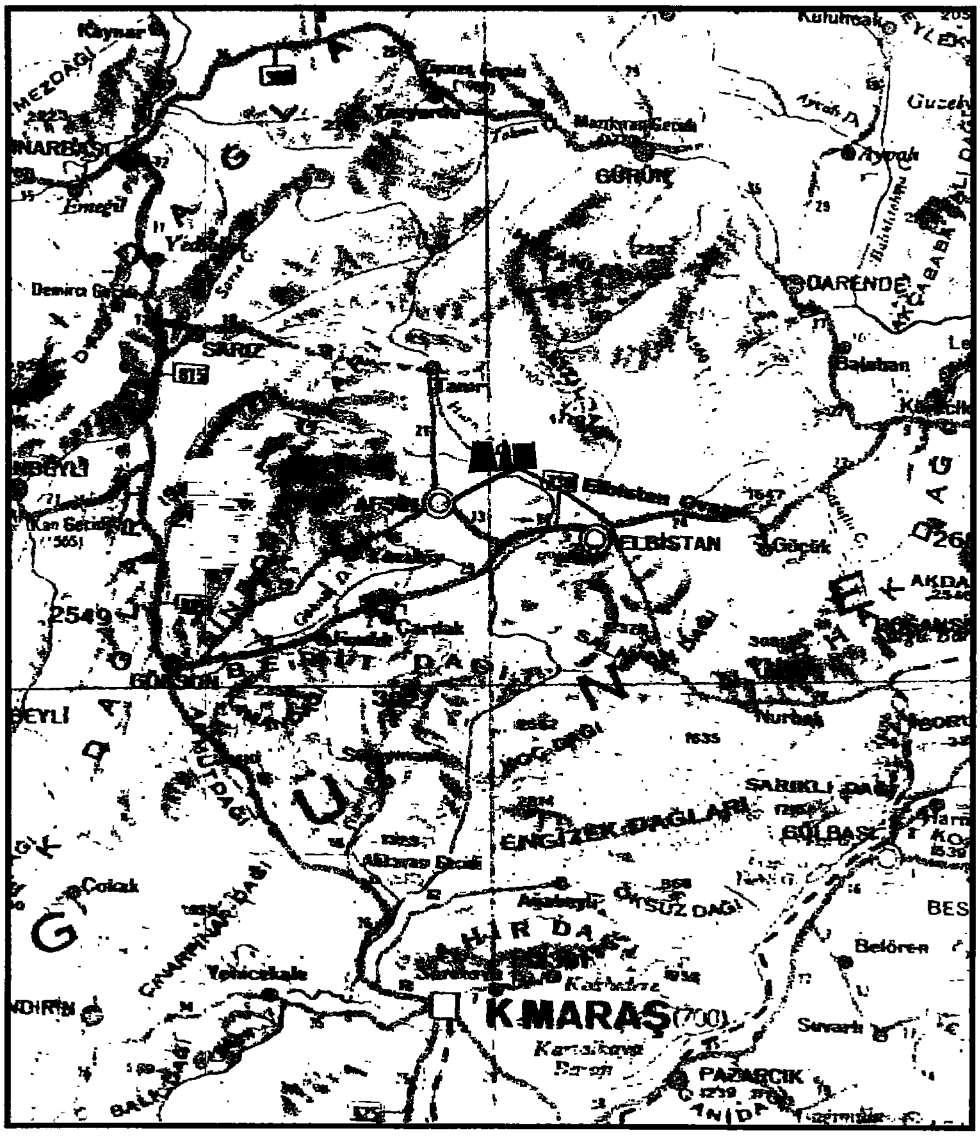


Figure II.2. Topographical Map Showing AEATPP

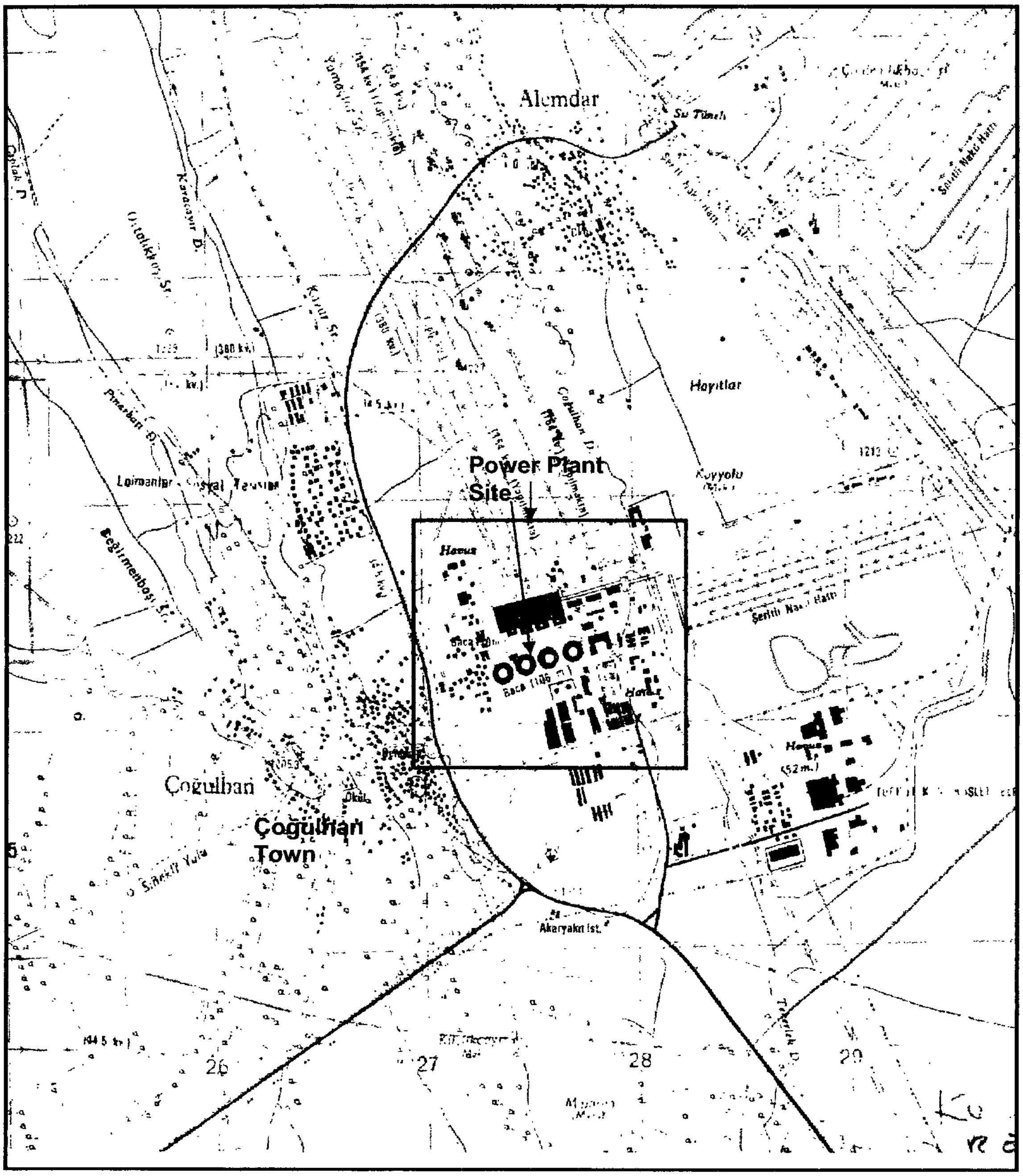


Figure II.3. Detailed Topographical Map Showing AEATPP

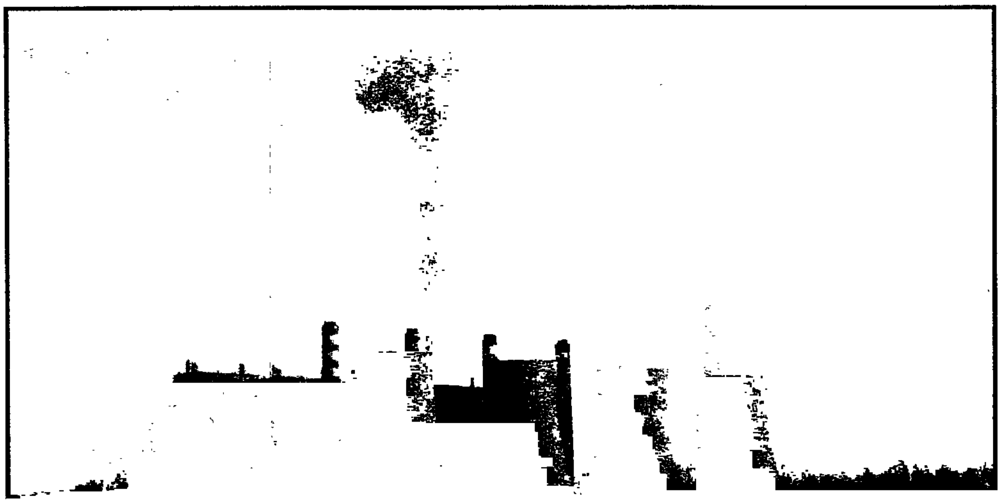


Figure II.4. View of the AEATPP

Figure II.5. View of the AEATPP (2)

CHAPTER III: DETERMINATION OF THE AREA TO BE AFFECTED FROM THE PROJECT AND DESCRIPTION OF ENVIRONMENTAL PROPERTIES IN THIS AREA

(Definition of environmental issues to be affected from the project and interaction between these factors)

III.I Determination of the Area to be Affected From the Project, Illustration of the Area on the Map

Project will be realized in the existing area of AEATPP. AEATPP is located within the Kahramanmaraş Province of Turkey. Location of the AEATPP is 14 km far from Afşin District and 30 km from Elbistan District. The nearest settlement places to the AEATPP are Çoğulhan Town, 500 meter from the power plant, and Alemdar Town that is about 1 km far from the power plant.

In order to determine the area that will be affected by the project, environmental, economical and social impacts have to be assessed together. These impacts may be direct or indirect. As the construction and operation phases of the project are considered, the impacts can be divided into two groups of long-term impacts and short-term impacts. The impacts of the construction phase are temporary and short-term. On the contrary, most of the impacts of the operation phase are long-term effects. Considering all impacts, the most important subject is the impact of the AEATPP on air quality. The impact area of the project has been chosen considering this. Therefore, environmental impact area of the project is taken as 20 kmx20 km area for which air quality modelling has been applied. This area is selected as impact area considering the Regulation on Industrial Air Pollution Control.

Project will affect Çoğulhan Town, Afşin District, and Kahramanmaraş Province from the economical and social point of view. The major economic affect will be on whole Turkey.

III.2. Characteristics of the Physical and Biological Environment and Use of Natural Resources

3.2.1. Meteorological and Climatological Characteristics (General and local climatological characteristics of the region, topographical structure of the Project region, temperature and precipitation regime, relative moisture, evaporation, number of the days when inversion occurs, stability, wind direction and speed, annual and seasonal wind rose etc.)

Because location of Kahramanmaraş Province far from the sea and much higher than the sea level, typical Mediterranean Climate is not observed in this province. Because the province is close to Central and Eastern Anatolia, continental climate influences here. As a result, it can be said that a modified Mediterranean Climate influenced by continental climate is dominant here. In the most of the province, dry and arid weather dominates in the summer while cold and snowy weather dominates in the winter but moderate weather of Mediterranean Climate is observed in the plains.

Afşin District is located at a point where Mediterranean, Central Anatolia and Eastern Anatolia intersect. Therefore characteristics of these three regions are observed in Afşin. Continental climate dominates. Dry and arid weather dominates in the summer while cold and snowy weather dominates in the winter. Most of the rains are formed during spring and autumn.

AEATPP is located on Afşin-Elbistan Plain and the average elevation of the region is about 1100-1300 meter. The power plant was constructed on a flat land. Meteorological data on the Afşin Meteorological Station is given by Table 3.2.1.1.

Table 3.2.1.1. Afşin Meteorological Station Data

Operation duration of the station	: 1975 – 2004
Latitude	: 38.15
Longitude	: 36.55
Elevation	: 1180 m

General Directorate of State Meteorological Works Afşin Meteorological Station Observation Records show that average temperature during 1975-2004 ranges between – 3.2 0C (January) and 23.2 0C (July), its average 10.2 ^{0}C (annual). Temperature increases from January to July regularly and it starts to decrease from August until December. The coldest months are December, January and February and the average temperature during these months is below 00C.

Maximum and minimum average relative moisture are 60% and 6% respectively. These ratios are significantly dependent on evaporation. In addition, wind direction affects relative moisture. Records also show that maximum and minimum average precipitation amount is observed during December and August as 64.8 mm and 1.1 mm.

Detailed meteorological data, especially on rainfall, temperature, atmospherical stability, is given by Section IV.2.5, where air quality modelling is presented.

Table 3.2.1.2. Long Term Average Temperature, Relative Moisture, Precipitation and Evaporation Values of Afşin Meteorological Station

Parameter	Months												Average
	January	February	March	April	May	June	July	August	September	October	November	December	
Average Temperature (°C)	-3.2	-1.5	3.5	10	14.7	19.2	23.2	22.8	18.1	11.8	4.6	-0.4	10.2
Average Relative moisture (%)	78	74	68	59	56	48	42	43	48	60	70	78	60
Average Total Precipitation (mm)	57.3	46.9	54.6	56.6	52.4	14.7	4.7	1.1	8.2	34.8	49.1	64.8	445.2
Average Cloudiness (0-10)	6.2	5.6	5.1	5.2	4.5	2.7	1.3	1.2	1.8	3.7	4.7	6.3	4
Average Evaporation (mm)	-	-	-	55.3	144.8	191.8	237.9	225.9	155	77.9	11.3	-	-

Wind data for Afşin District according to the records of Afşin Meteorological Station are given below.

Table 3.2.1.3. Long Term Wind Direction, Number of Blowing and Average Wind Rose Values

Wind Direction	Number of Blowing	Average Speed (m/s)
N	1092	2.8
NNE	1581	1.9
NE	816	1.6
ENE	1640	1.3
E	667	1.3
ESE	1318	1.5
SE	802	2.2
SSE	1618	1.7
S	977	1.9
SSW	2243	2.7
SW	1148	3.3
WSW	957	2.2
W	254	1.6
WNW	515	1.7
NW	782	3
NNW	2084	2.7

Graphs of the meteorological data and wind roses of Afşin are given below.

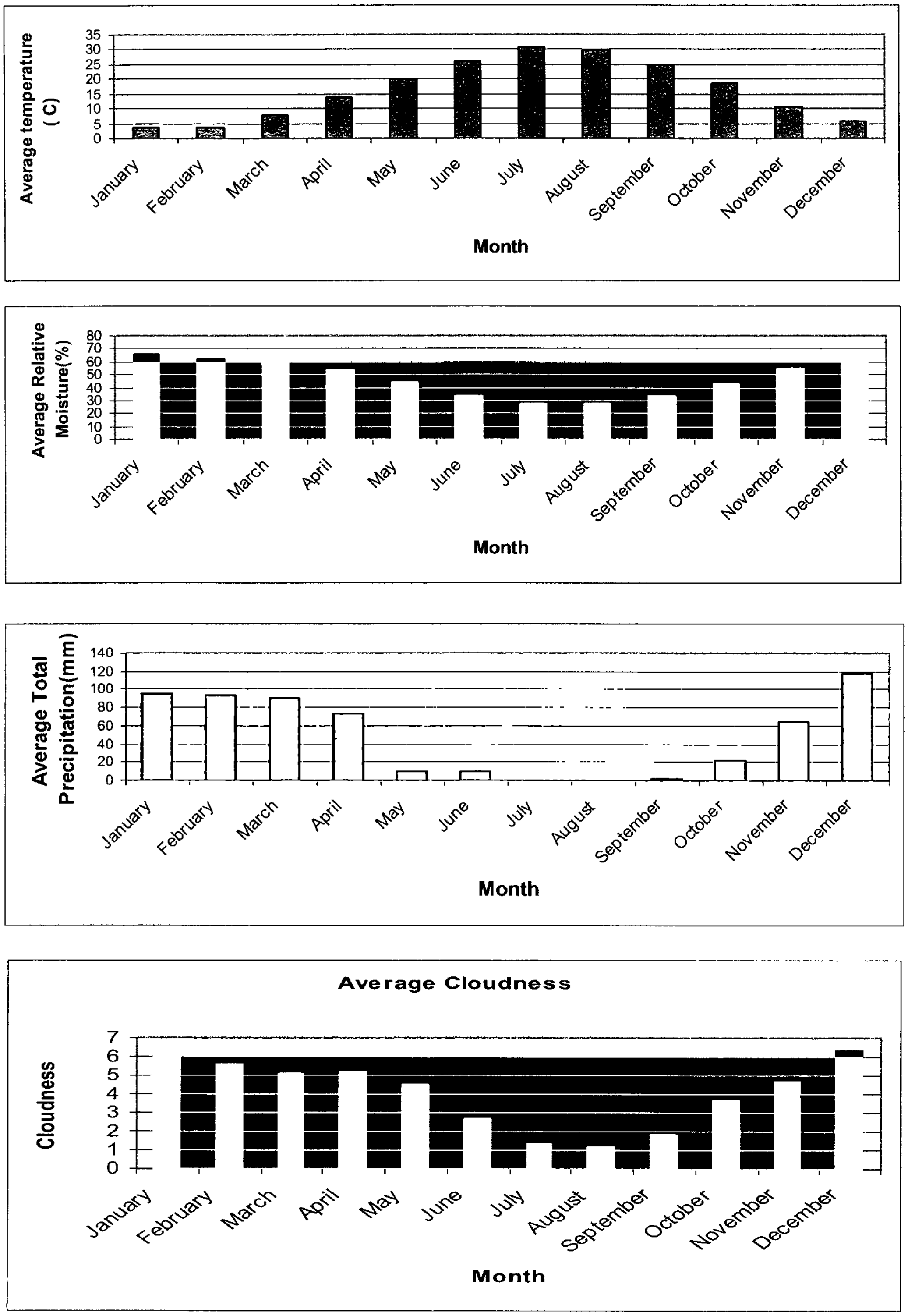


Figure 3.2.1.1. Graphs of the Meteorological Data of Afşin

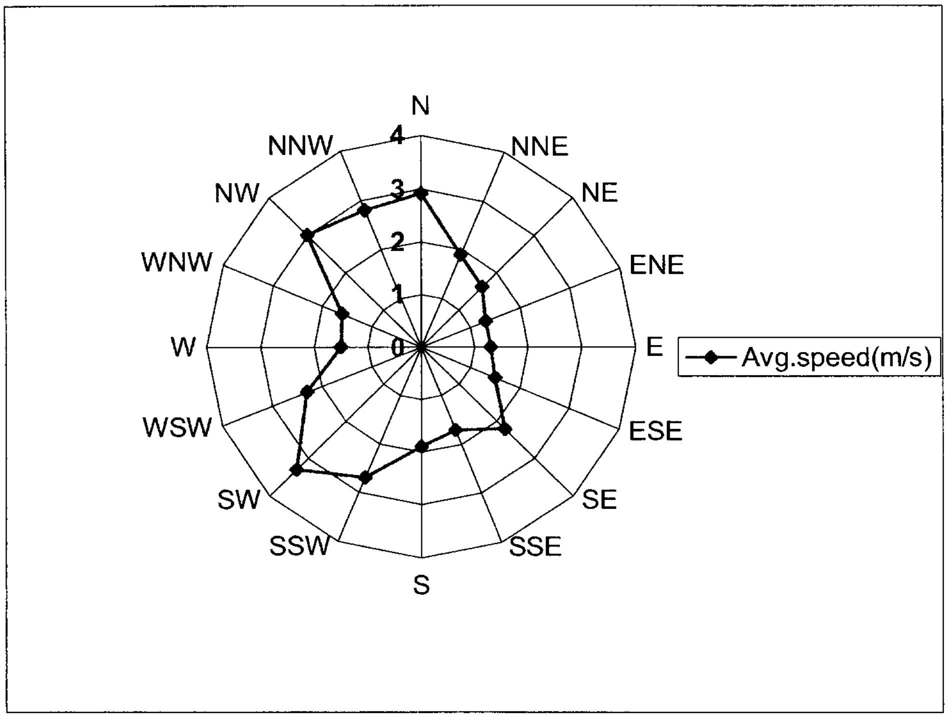


Figure 3.2.1.2. Wind Rose of the Meteorological Data of Afşin

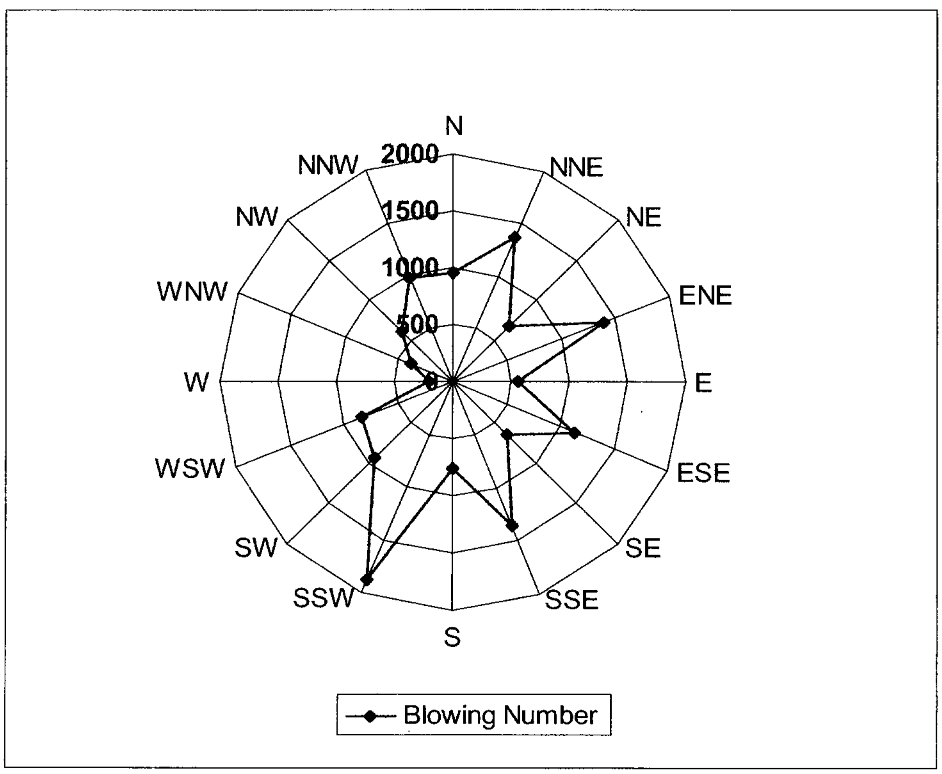


Figure 3.2.1.3. Wind Rose of the Meteorological Data of Afşin

3.2.2. Geological and Hydrogeological Characteristics

Geology of the Project Area

The geological units at the project area and its surrounding from oldest to youngest are given below. The general geological map (1/25000) of the project area and the generalized columnar section of the study area are given in Figure 3.2.2.1 and Figure 3.2.2.2, respectively.

- Permo-Carboniferous (limestones phyllite-schist facies)
- Upper Cretaceous (limestones Alacalı Complex-conglomerates, sandstone, clayey schist)
- Eocene (limestones)
- Neogene
- Miocene (marl, sandstone)
- Plio-Pleistocene (clay, gravelly-sandy clay, lignite, Gidya level decomposed organisms, silt, sand, plant residues)
- Quaternary (alluvium, terraces)

Permo-Carboniferous

The oldest rocks in the area are Permo-Carboniferous limestones, phyllite-schist facies. Limestones exhibit strong crystallization and local bedding which is gray, white and rarely dark colored. Phyllite and clayey schist are seen as thin veinlets and intercalate with limestones. Permo-Carboniferous facies show NE-SW oriented beddings and outcrop at Kızıldağ at the north of the area.

Upper Cretaceous

It is composed of light colored limestones and ophiolitic type magmatics, conglomerates, sandstones and clayey schists called Alacalı Complex. It alternates with limestones. The Upper Cretaceous units expose at the north and east of Kışlaköy, at the north and south of Elbistan (Kızıldağ) and Şardağ.

Eocene

Nummilitic limestones overlie the Permo-Carboniferous and Upper Cretaceous units with discordance. The Eocene units start with base conglomerates trangressively and discordances. Generally they dip towards north with 50 m thickness. The Eocene units cover large areas at the Tekne Mountain where they are well bedded, light colored limestones with 200 m thicknesses.

Neogene

Miocene

It forms from marine facies marl and sandstone which comes over Upper Cretaceous limestones with discordance.

Plio-Pleistocene

The older units in the area are usually covered by young fresh water deposits and fluviatal facies. The young fresh water deposits in the area starts with clay, limey clay, gravelly clay and sandy clay and continues with a thick lignite bearing layer.

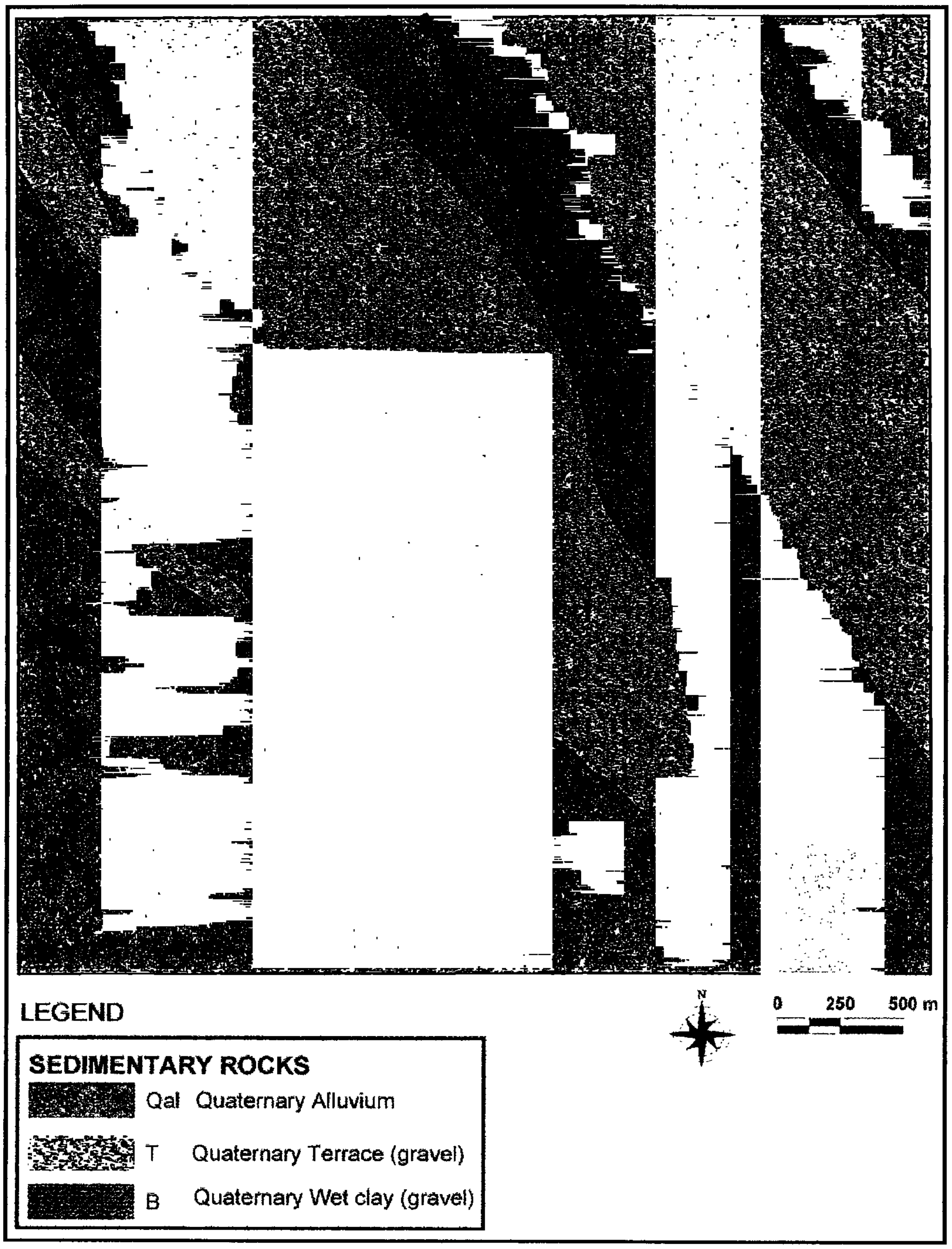


Figure 3.2.2.1. General Geological Map of the Project Area

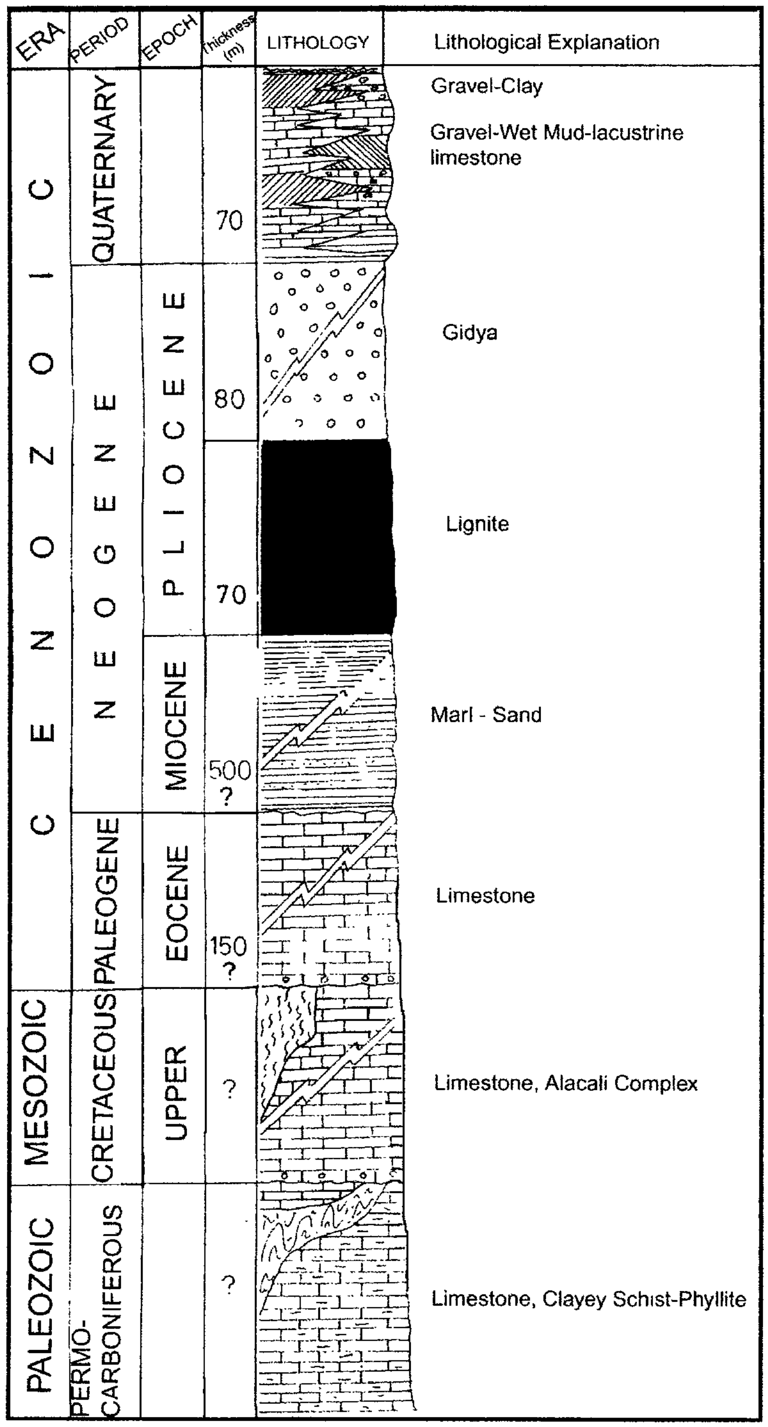


Figure 3.2.2.2. Generalized Columnar Section of the Study Area

This lignite bearing layer has 30-70 m thickness according to lignite reserve drills and it is Pliocene aged. The lignite level is overlain by Gidya level which is composed of various colored and featured decomposed organisms, silty, sandy, plant residues and gastropode fossils bearing deposits. The thickness of Gidya level changes between 15-80 m according to reserve drills. In the region fresh water limestones are locally observed above Gidya level indicating the last phase of young fresh water deposits. They usually outcrop at the edge of basin with approximately 20 m thickness.

Quaternary

At the project area above the Gidya level Quaternary aged fluviatal facies deposits of wet clay, gravel, clay and terraces are observed.

Terraces

The gravel series are seen as terraces at most parts the basin. The gravels are mostly the gravels of the base rocks in the region and gravels of lacustrine limestones seen at the edge of basin. The uppermost part of the terraces dips towards centre of basin at which the oldest terraces are at the edge of basin. The size of the gravels decreases towards centre of basin.

Alluvium

They are observed along the Hurman Creek and at extensive areas in the region because of the accumulation characteristic of Hurman Creek. The Quaternary aged deposits completely cover the Pliocene aged formations.

In the region there are no special geological and geomorphological features and there is no negative effect of the activity on the geological point of view.

Tectonic

The area is in the east tourid belt belonging to the Anatolian tectonic units. As a result, the area is subjected to highly fracturing, deformations and strong tectonic forces. On the other hand, the project area is tectonically quiet at which the old and young sedimentation in the region is usually horizontal. Most probably after the deposition of lignite a rising of the edge of basin occurred. The highly fragmentation of schists makes the possibility of region undergoing into Hersenien phase. Besides, it is proved the region had undergone into Laramien orogeny between Upper Cretaceous and Paleocene.

Hydrogeology of the Project Area

The Elbistan and Göksun plains are water catchment areas at and around the project area. The direction of groundwater flow in the project area is from northwest and northeast to south towards Hurman Creek. The groundwater level is between 1-20 m depth from the surface (Source: Mırmırıntepe Limestoen Site EIA Report). Groundwaters are taken out by water pumps and used for irrigation purposes where locally artesian type wells are also present.

The biggest river in the project area is Hurman Creek. The long term average discharge of Hurman Creek is 8.207 m^3/s. The creeks that join the Hurman Creek in the plain are Özdere, Karasu, Berçenek, and Dağla creeks. The formations that bear groundwater in the project area can be summarized as follows;

Basement Rocks and Formations

The Permo-Carbonifeorus aged limestones and Upper Cretaceous limestones, Alacalı Complex conglomerates and sandstone levels show aquifer properties. Especially Permien and Upper Cretaceous aged limestones exhibit jointed, fractured and karstic structures which are also good sources of water reservoir. It is possible to feed the upper levels with groundwater along the faults at base and the waters are usually found along faults, fractured zones, at the fractures of ophiolites and at the contacts of formations in the area.

Besides, marl and clayey levels on top of aquiferous limestones acquires captive layer (water capturing layer) properties to these levels. The Eocene aged limestones and conglomerate levels outside the project area possibly carry some amount of groundwater. The schist and quartzites in the metamorphic series are also good sources of drinking water in the area.

Lignite Zone

According to the preliminary observation well measurements the lignite level in the area has groundwater and the artesian characteristics of these wells indicate that the lignite level has captive layer properties.

Gidya Level

According to preliminary observation well measurements Gidya level carries groundwater. It is captive layer properties understood by the artesian behavior of the wells. Gidya level includes groundwater but does not give out much water by pumping.

Cover Layers (Alluvium-Terraces)

This level comes over Gidya level which has aquifer and captive layer properties in the project area.

Springs

Springs with very small discharges are seen at the basement formations of the area. At the Küçük Çayır locality groundwater run out at depressions in the area as the level of groundwater level is higher than topography and the outcoming waters flow into Hurman Creek by channels due to inclination. Especially the fractures at ophiolites contain lots of springs where sometimes they form small creeks when joined. These reservoir rocks are not covered and exposes at spring locations.

3.2.3. Soil Characteristics and Its Usage (Soil Structure, land use capability classification, pastures, meadows etc.)

Soil characteristics of the region have been determined by both field survey and literature surveys. Soils of the region mainly composed of Alluvial, Colluvial, Brown and Red Brown Soils. Most of the soils have heavy, neutral, less alkaline structure and very rich in lime. Permeability of the soils is very good and these soils have no drainage problem.

Table 3.2.3.1 shows distribution of major soil groups in Afşin District.

Table 3.2.3.1 Distribution of Major Soil Groups in Afşin District

	Area (ha)
Alluvial Soil	6557
Colluvial Soil	9680
Non-calcareous brown forest soils	20094
Chestnut colored soils	2566
Brown Soils	67692
Calcareous brown soils	10089
Red Brown Soils	33621
Bare Rocks and Rubbles	14948
River Flood Plain	90
Land Dunes	71
Total	165408

Source: Kahramanmaraş Province, Environmental Report

Afşin District Land Use Capability Classes are given by Table 3.2.3.2.

Table 3.2.3.2. Afşin District Land Use Capability Classes

Class	Area (ha)
I	26678
II	16658
III	8943
IV	7565
VI	12153
VII	60302
VIII	15109
Total	147408

41% of soils are agricultural lands, 39% of soils are meadow and pastures, 9% are forest lands, 10% are other lands and 1% of settlement places. Table 3.2.3.3 and Figure 3.2.3.1 show landuse and capability classes' distribution.

Table 3.2.3.3.Distribution of Land Use according to Capability Classes in Afşin

Land Use	Land Use Capability Classes (Ha)						Total
	I	II	III	IV	VI	VII	
Agricultural lands	25258	15205	7408	6266	4826	435	59398
-Rainfed Agriculture (Fallowed)	15833	9432	5806	3894	3424	301	38690
-Rainfed Agriculture (Not Fallowed)				215			215
-Irrigated Agriculture	7603	5773	705	351	743	6	15181
-Insufficient Irrigated Agriculture	1822			230			2052
Vineyard (dry)			897	1576	659	128	3260
Pasture-Meadow	124	1314	1363	1267	6774	49146	57988
Pasture Land	124	1314	1363	1267	6774	49146	57988
Forest –Shrubbery			109		2414	10607	13130
Forest Land						6255	6255
Shrubbery			109		2414	4352	6875
Non-agricultural Land	1296	139	63	32	139	114	1783
Settlement (Dense populated)	63						63
Settlement (Less populated)	1233	139	63	32	139	114	1720

Source: Kahramanmaraş Province Land Use Book, KHGM, 1997

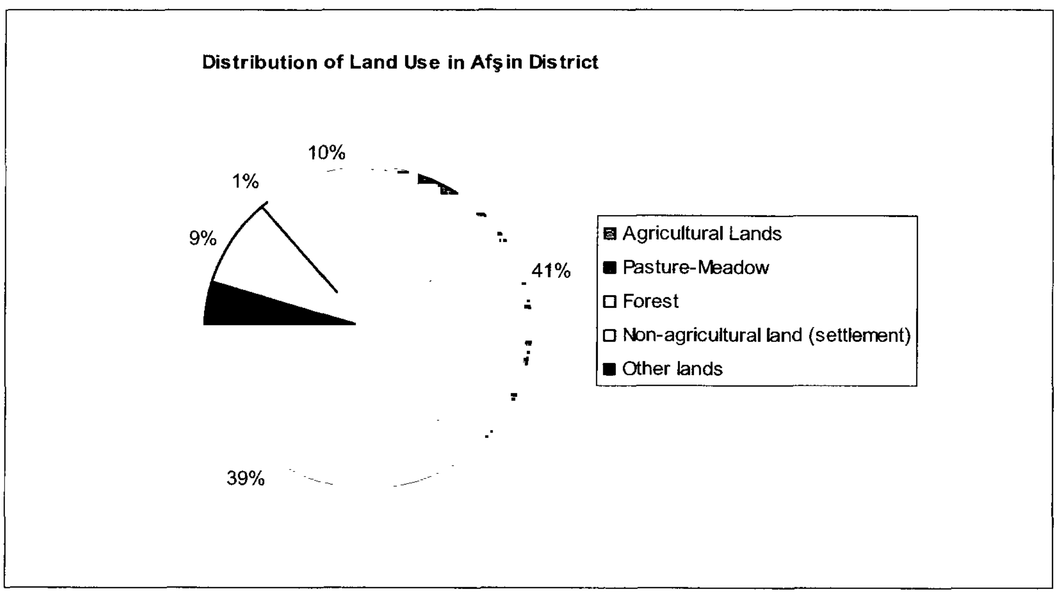


Figure 3.2.3.1. Distribution of Land Use in Afşin District

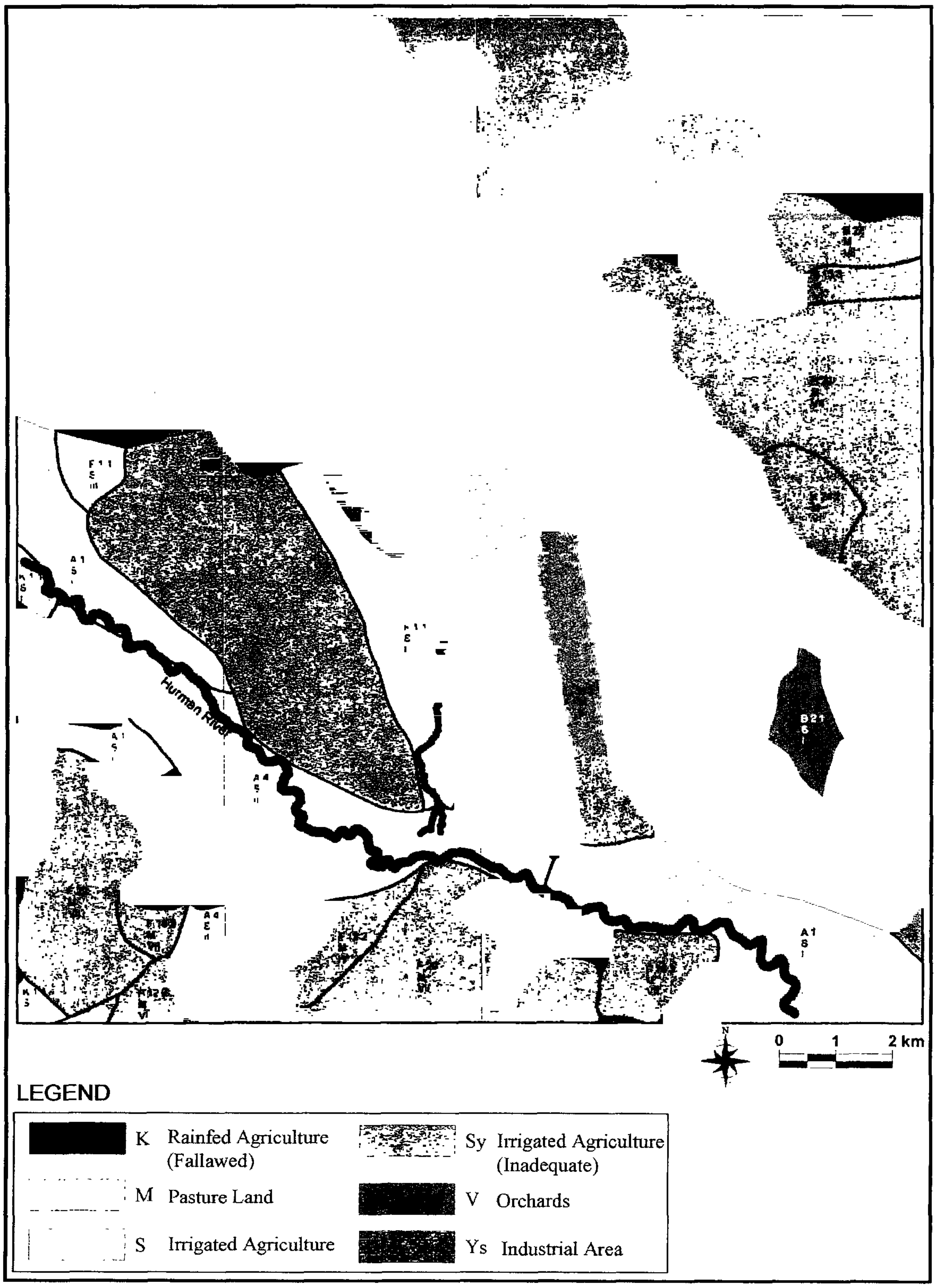


Figure 3.2.3.2. Land Use Map around Project Area

AEATPP is located on, alluvial, colluvial and forest soil group and the capability class of the soil is Class I. Erosion degree is "less erosion"

Alluvial Soils:

An azonal great soil group of soils, developed from transported and relatively recently deposited material.

Colluvial Soil:

Materials that have moved downhill and have accumulated on lower slopes and/or at the bottom of the hill; moved downhill by the force of gravity and to some extent by frost action and local wash.

Brown Soils:

A great soil group of the temperate to cool arid regions composed of soils with a Brown surface and a light-colored transitional subsurface horizon over calcium carbonate accumulation.

The existing soil sample analysis and literature study shows that the soils of the region and agricultural areas have alkaline character. Therefore, soils of the region show the ability to neutralize SO_2 deposition.

3.2.4. Agricultural Lands (Agricultural development Project areas, size of irrigated and rainfed agricultural areas) product patterns, their annual production values, and efficiencies according to unit area, used agricultural fertilizers)

Impact of AEATPP on agricultural lands and products are presented later in this section after general information given on agricultural lands and products of Afşin Region.

Afşin District Agricultural Lands and Products

Agricultural areas cover 59,398 m^2 areas in Afşin District where AEATPP is located. 38,905 m^2 of that is rain-fed agricultural area and 20,493 m^2 is irrigated agricultural area. Detailed information on agricultural areas is given by the Table 3.2.4.1.

Table 3.2.4.1. Afşin District, Agricultural Lands

Landuse	Area (ha)
Rainfed agriculture (Fallowed)	38690
Rainfed agriculture (Not Fallowed)	215
Irrigated agriculture	15181
Insufficient irrigated agriculture	2052
Agricultural lands (Total)	59398

Source: Kahramanmaraş Province Land Use Book, KHGM, 1997

The most produced group of product is field products. Table 3.2.4.2 shows the information on planred area, production and efficiency of the field plants.

Table 3.2.4.2. Afşin District Field Plants Production Data

Group Name	Planted Area (Ha)	Harvested Area (Ha)	Production (Ton)	Efficiency (kg/Ha)
Cereals	34,619	34,619	59,041	7,36
Leguminosae	13,657	13,657	20,467	5,729
Industrial crops	2,488	2,488	124,896	50,199
Oil seeds	2,087	2,087	2,411	1,155
Tuber crops	363	363	7,168	45,068
Fodder crops	252	252	2,422	13,355
Afşin Total	53,466	53,466	216,405	122,867

Source: SIS, 2005

Fruits and vegetables are also produced in Afşin. Table 3.2.4.3 and Table 3.2.4.4 show the detailed information on the production of fruits and vegetables.

Table 3.2.4.3. Fruit Production in Afşin

Group Name	Total	Bearing	Not Bearing	Production (Ton)	Area Covered (Ha)
Pome Fruits	51,28	44,98	6,3	1,39	271
Stone Fruits	18,183	18,183	0	1,304	158
Nuts	1,475	1,475	0	258	18
Grape and Grape-like fruits	3,45	3,45	0	9,267	945
Afşin Total	74,388	68,088	6,3	12,219	1,392

Source: SIS, 2005

Table 3.2.4.4. Vegetable Production in Afşin

Group	Production (Ton)
Leafy or stem edible vegetables	1,265
Leguminous Plants	400
Tubercle Plants	27,3
Feed Plants	80
Afşin Total	29,045

Source: SIS, 2005

3.2.5. Hydrological Properties, and the Current and the Planned Usage of the Surface Water Source (Physical, chemical, bacteriological and ecological properties of the surface water sources such as rivers, lakes and other water sources and seasonal changes to this extent)

The main water sources of Afşin District are Hurman stream, which is a branch of Ceyhan River, Göksun Stream and Mağara Gözü Stream. There has been irrigated agriculture in the plain side of the district. Hurman stream, passing through the Afşin Plain, is the most important stream of Afşin District. Ceyhan River is sprung form the Pınarbaşı Locality, which is located in 3 km east of Elbistan.

The drinking water of Afşin District is supplied from Çobanpınarı Spring. This spring is 5 km west of Afşin District and 22 km from AEATPP. Drinking water source of Elbistan District is Ceyhan Spring that is southeast. The flow amount of the spring is 5-7 m^3/s. Based on information from Elbistan Municipality, existing water supply of the Municipality is 0.35 m^3/s and the future demand will be about 0.6 m^3/s. The need of the AEATPP with its FGD unit will be 1.5 m^3/s. Therefore, water supply of the AEATPP will not have a drawback. The drinking water demands of Çoğulhan and Alemdar Towns are supplied by drinking network that uses groundwater sources.

The project site and its environment are not near a seaside. In this context, the water resources of the region are made up of surface water and underground water.

Inland Surface Waters

The region is located in the Ceyhan River basin and has a large stream network. There has been Söğütlü stream, which is found in the district Elbistan, Hurman, Nargile and Nurhak stream in the region. Hurman stream also passes through Afşin plain and it is the most important stream of Afşin District. There is no natural lake in the region other than small crater lakes. However, there are a lot of dams in the region.

Being one of the most important streams, Ceyhan River is sprung from Pınarbaşı locality, which is located 3 km east side of Elbistan district, and its length is approximately 220 km in the border of province of Kahramanmaraş. Slope is more than 1% in the middle and the upper parts of the river. In sequence, Ceyhan River is connected with Söğütlü, Hurman and Göksun streams and it flows in narrow and deep valleys in some places. The flowrate of Ceyhan River is 301 m^3/s as an average and this value is reduced to 56 m^3/s in dry months and is increased to 1.960 m^3/s in spring months (Kahramanmaraş Governorship, 1993). However, so-called surface water sources are located outside the projects influence area.

Sources

As a consequence of the excessive karstic formations in the mountainous areas which surround the region, rain and snow water is entering through the springs in the hillsides. The most attractive springs are Pınarbaşı located in Elbistan and springs located in Tanır. The water temperature in the so-called springs is below 10 °C and pH value is neutral.

Drinking, Usage and Irrigation

There are many dam lakes in the region used for irrigation, drinking, energy production or flood prevention. The dam lakes in the region are also suitable for professional and amateur fishing activity. Also, there has been fresh water fish production by the fishing cooperatives found in the region. The surroundings of the dam lakes are very suitable for the recreational use because of the rich vegetative cover and the easy transportation from the settlements.

Table 3.2.5.1. Rivers of Kahramanmaraş Province and Use of Them

River	Average flow (m^3/s)	How it is used
Ceyhan River	27.36	Irrigation and energy
Göksun Stream	13.06	Irrigation
Aksu Stream	32.56	Irrigation and drinking water
Körsulu Stream	4.34	Energy
Andırın Stream	3.23	Energy and irrigation
Kesiş Stream	12.84	Energy and irrigation

Source: Province Environmental Condition Report

Table3.2.5.2. Lakes and Ponds in Kahramanmaraş

	Surface water (ha)	Location	Source
Gavur Pond	76	Türkoğlu	Natural lake
Kumaşır Lake	9	Kahramanmaraş	Natural lake
Kızıliniş Pond	34	Türkoğlu	İmalı Stream
Sarsap Pond	70	Elbistan	Sarsap Stream
İncecik Pondi	6.28	Elbistan	İncecik Stream
Merk Pond	2.22	Çağlayancerit	Kurudere and Cacık
Zorkun Pond	15.1	Çağlayancerit	Zorkun Stream

Source: Province Environmental Condition Report

The streams are not suitable for sports, transportation. These streams are generally regarded as second quality.

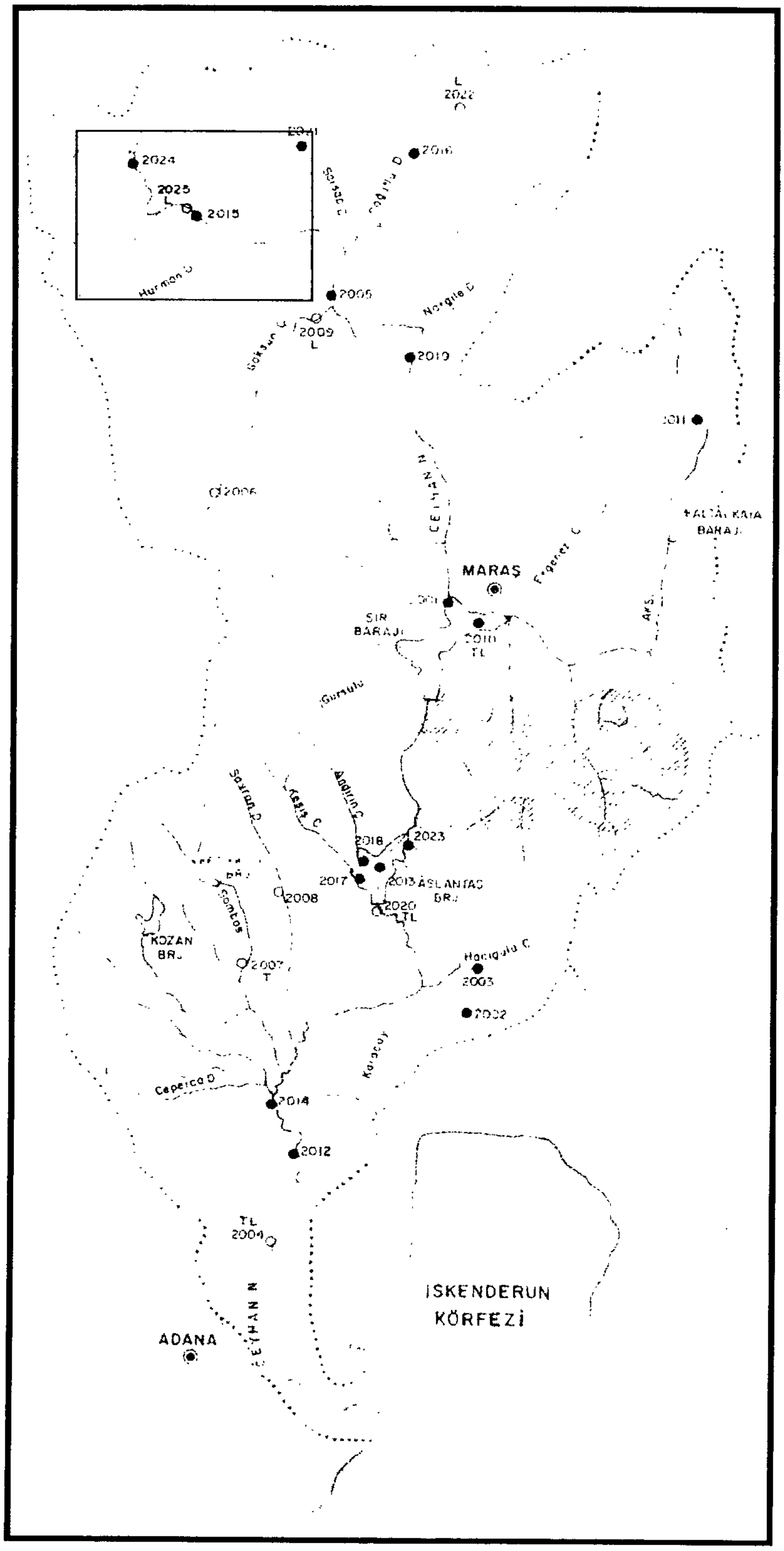


Figure 3.2.5.1. The Rivers and the Stations in the Region

Table 3.2.5.3. Hurman Stream Flow Values

Station No	Stream	Place	Observation duration (year)	Long term average flow (m^3/s)
2015	Hurman Stream	36 55'14"D- 38 25' 21" in Tanır Town	39	8.207
2024	Hurman Stream	36 54' 28" D-38 34' 23" 20 km north of Tanır Town	3	4.551

Source: EİE, Water Flow Averages

Ecological Characteristics

The immediate project impact area does not constitute a special living and breeding habitat for the aquatic and terrestrial flora and fauna species. Planned project will be realized in the existing power plant area using existing rights-of-way. Any impacts would be minor and short-lived and is very unlikely to result in any habitat loss for any species since this is an area that has been used for commercial/industrial activities for a long time. By the rehabilitation of power plant and construction of FGD unit, the ambient air quality will increase and that will have a positive impact on terrestrial fauna indirectly.

Fish species that live and possible to live in the surface waters in the impact area are explained below. These species are not specific to the project area, these exist also in other regions in Turkey. There are no endemic fish species in the project impact area, and no negative impact of the rehabilitation project and operation of the power plant on the ecological characteristics is likely.

Salmo trutta macrostigma

Their bodies are grey black colored and black spotted, their tails are red spotted. Black spots are on side line. They usually prefer oxygen rich, clear and cold mountain rivers. The period for laying eggs is November-December and in this period, they lay their eggs to gravel flor of shallow waters of high river basin. They feed on fishes and insects. They are not “strictly protected” or "protected" species according to Bern Convention Annex-2 and Annex-3.

Leuciscus cephalus

Their bodies are covered with big silver colored scales. They leave eggs between April-June and stick their eggs on rocks and wood pieces. Eggs open after 6-8 days. They become mature at 3-4 years. Females leave 50.000-200.000 eggs at time. They fed on invertebrate and algae while young, and on big invertebrate and fishes. They are not “strictly protected” or "protected" species according to Bern Convention Appendix-2 and Annex-3.

Silurus glanis

They hide between water plants and muds. Youngs fed on invertebrates and mature ones fed on fish and frogs. They leave 100.000-500.000 eggs during May-July. They are "protected" species according to Bern Convention Annex-3.

Capoeta capoeta angorea

Its length is 10-15 cm. Male is smaller. Each female leaves 3000-10000 eggs during July-September. It lives in gravelly and stony grounds of speedy flowing rivers. They fed on plants and have high nutrition value. Male become mature at 2 years, female become mature at 3 years. They are not “strictly protected” or "protected" species according to Bern Convention Annex-2 and Annex-3.

Chondrostoma regium

They fed on plant, worm and crustaceous. They have a spotted dark band lying from head to tail. The breeding period is between March-May and female leave 10.000 eggs at a time. Their length is about 25 cm. They are not “strictly protected” or "protected" species according to Bern Convention Annex-2 and Annex-3.

Barbus capito

They live in deep places of freshwaters. They are found under the rocks and stones. They fed on small insect youngs, invertebrates and some vegetable residuals. Breeding period is between May and July. They are not “strictly protected” or "protected" specie according to Bern Convention Annex-2 and Annex-3.

Capoeta barroisi

This specie has records around Adana, Adana, Kahramanmaraş and Antakya in Turkey and common in Ceyhan river system. It is not “strictly protected” or "protected" specie according to Bern Convention Annex-2 and Annex-3.

Orthrias (=Noemacheilus) insignis

Their bodies and heads are round. Their back side tail fins are concave. Their length is 6-8 cm, maximum 9 cm. There are 6 moustaches surrounding mouth. They leave eggs on stone and plants in shallow waters during May-July. They are fed on insects and the worms. They are not “strictly protected” or "protected" specie according to Bern Convention Annex-2 and Annex-3.

Orthrias (=Noemacheilus) panthera

They live in sandy and gravelly grounds of fresh calm rivers and streams. Breeding period is during May-July, they stick their eggs on plant bodies and gravels and stones. They are usually fed on insect youngs and worms. They are not “strictly protected” or "protected" specie according to Bern Convention Annex-2 and Annex-3.

3.2.6. Flora and Fauna (Species, Endemic Species, Wildlife Species, Species Under Protection by National or International Legislation, Rare and Endangered Species and Their Habitats, Protection Decisions for These Species, Protection Measures for the Living Beings Impacted from Project Activities (during construction and operation phases), Field Study for Flora should be Conducted during Vegetation Period, Determination of This Period)

Flora and fauna studies of EIA Report of Rehabilitation of AEATPP and Construction of FGD Plant Project were conducted by expert biologist Fatma Dinç (M.Sc.) during January, February, March and April, 2005.

Flora and fauna species that live in the project impact area are explained below. The rehabilitation project is not likely to have any negative impact on the flora and fauna species found in the impact area. The Project is a rehabilitation project and retrofit of FGD in the second phase will extend efficiency and reliability and decrease the emissions below the limits. Impacts on flora and fauna species are stated at Section IV.2.9.1.

It should be taken into account that only one vegetation period cannot reflect the flora fauna of that region. Therefore, the species that is observed at previous EIA Studies in this region are also considered in this study. Even if these species could not be observed in the field studies conducted for this project, the EIA report includes these species to the tables.

Flora

The project area is located in the B6 square of Gridding System. “Flora of Turkey and East Aegean Islands” publication of Davis have been the main source for the detection of the flora species. In addition, the field survey study has been supported by the review of same publication. Flora inventory prepared by field and literature surveys is given by Table 3.2.6.1. (Annex B.12). Table includes Latin names of all flora species, their habitats, endemism, phytogeographical regions, IUCN Red Data Book categories and relative abundance degrees.

- **Vegetation**

General vegetation of the region is composed of oak forests, forests of tree species, low and high mountain steppes and aquatic vegetation. The natural vegetational cover of the region is mainly distracted and andropogenic steppes are common. The surrounding of the power plant is covered with agricultural lands.

The most common species in the streams around project area are: *Juncus alpinus subsp. alpinus, Juncus bufonius, Schoenoplectus supinus, Typha domingensis, Typha latifolia, Sparganium erectum subsp. Microcarpum, Sparganium erectum subsp. Neglectum, Euphorbia altissima var. altissima, Euphorbia falcata subsp. falcata var. falcata, Euphorbia falcata subsp. falcata var. galilaea, Euphorbia falcata subsp. macrostegia* ve su içinde *Lemna gibba, Potamogeton berchtoldii, Potamogeton nodosus, Potamogeton panormitanus. Populus euphratica* (poplar), *Salix excelsa* (willow) and *Elaeagnus angustifolia* (oleaster) are very common.

In this region, forest upper level is about 1800-2000 meter. They are generally Cedrus *libani* (cedar), sometimes *Abies cilicica subsp. cilicica* and *Pinus nigra subsp. pallasiana* (blackpine). Cedar, fir and blackpine show poor growth. Oak species shows more growth. Between Göksun and Afşin, specifically between Binboğa and Berit Mountains, *Quercus cerris var. cerris* is also observed. *Ouercus cerris var. cerris*, *Quercus petraea ssp. pinnatiloba* groups are wide in west and south of the mountains (such as Nurhak) surrounding the project area. Juniper species such as *Juniperus excelsa* and *Juniperus foetidissima* are very common in the places where the forests are destracted. Junipers and forests and oak places, *Juniperus oxycedrus ssp. oxycedrus*, *Crataegus monogyna ssp. monogyna*, *Rosa canina* and *Pyrus elaeagnifolia subsp. elaeagnifolia* bushes are very common. These bushes also characterize steppe transition regions. Furhermore, the species of Mediterranean Region are also observed in the south of Berit Mountains.

The andropogen steppes shown around the project location formed as a result of distraction of forest and shrubs. Steppes are common in the slopes tha are not appropriate for agriculture. In the elevations of 1700-1800 meters, *Astragalus sp.* and *Acantholimon sp.* species are common. *Astragalus gummifer, Astragalus amblolepis* and *Astragalus macrocephalus subsp. finitimus* are dominant species. Dominant species of 1800-2500 meters are *Onobrychis cornuta, Astragalus lamarckii* and *Astragalus tauricolus*.

- **Habitat Characteristics**

- Crop fields: The most widespread biotope in study area and its vicinity
- Steppe vegetation: This vegetation is seen in study area, apart from agricultural lands.
- Brow with gravel: In these fields, substrate is so active and soil is too shallow.
- Rocky areas: These biotopes are almost made up limestone rocks.
- Road sides: Biotopes with sparse vegetation usually dry soils.
- Wetlands: They are not widespread in study area, but observed in only in the sides of creeks and brooks, and in the small lakes.
- Brushwood: It is between Göksun and Afşin, out of study area.
- Blackpine forests: It is between Göksun and Afşin, out of study area.

- **Endemism**

There are wide varieties of endemic plant species in Turkey due to the fact that Turkey is international transition region. 30% of plant species determined in Turkey are endemic. 1994 IUCN Red Data Book categories used in "Red Data Book of Turkey's Plants" prepared by Ekim, T. and his friends (2000) are explained below.

CATEGORY	DEFINITION	CATEGORY	DEFINITION
EX	Extinct in the Wild	DD	Data Deficient
EW	Extinct in the wild	NE	Not Evaluated
CR	Critically endangered	LR (cd)	Conservation dependent
EN	Endangered	LR (nt)	Near threatened
VU	Vulnerable	LR (lc)	Least concern

20 plant species considered endemic to Turkey possibly exist in the project impact area. All of these species are listed in LR-lc category, i.e.,. they are widespread and abundant in Turkey and there is no possibility for these species to be endangered. In addition, among the flora species which were determined by land and literature survey and are given in Annex B.12, no species are endangered and to be protected in accordance with Bern Agreement Annex-1. The species are; *Acanthus hirsutus BOISS., Achillea kotschyi BOISS. subsp. canescens BASLER, Cousinia foliosa BOISS. ET BAL., Hieracium bornmuelleri FERYN, Leontodon oxylepis BOISS. ET HELDR. var. divaricatus (BOISS.) KUPICHA, Tanacetum cadmeum (BOISS.) HEYWOOD subsp. cadmeum DC., Tripleurospermum callosum (BOISS. ET HELDR.) E. HOSSAIN, Cynoglottis chetikiana VURAL ET KIT TAN subsp. paphlagonica (HAUSSKN. EX BORNM.) VURAL ET KIT TAN, Nonea macrosperma BOISS. ET HELDR., Nonea pulla (L.) DC. subsp. monticola RECH. FIL., Onosma armenum DC., Onosma tauricum PALLAS EX WILLD. var. brevifolium DC., Asyneuma rigidum (WILLD.) GROSSH. subsp. sibthorpianum (ROEMER ET SCHULTES) DAMBOLDT, Campanula saxonorum GANDOGER, Convolvulus assyricus GRISEB., Astragalus lamarckii BOISS., Astragalus tauricolus BOISS., Marrubium cephalanthum BOISS. ET NOE, Linaria genistifolia (L.) MILLER subsp. confertiflora (BOISS.) DAVIS, Quercus petraea (MATTUSCHKA) LIEBL. subsp. pinnatiloba (C. KOCH) MENITSKY.*

- **Phytogeographical Region**

Study area locates in Irano-Turanien Phytogeographical Region. Middle and Eastern Anatolia is very rich in flora. The north of the Irano-Turanien Phytogeographical Region of Turkey is formed by Europa-Siberian flora region, west and south of it is formed by Mediterranean Phytogeographical Region, east of it is formed by Anatolian Diagonal.

Middle and East Anatolia has very rich flora. The structure of endemic flora of Middle Anatolia has effects of Irano-Turanien Phytogeographical Region and Mediterranean Phytogeographical Region. The north of Middle Anatolia is under the effect of Mediterranean and Euxin Components and the south of it is under the effect of Mediterranean Components.

- **Distribution of Flora Species with Respect to Phytogeographical Regions**

Phytogeographical Regions are stated in the flora table. (-) sign is used in flora table in indication of the species which are widely spread and phytogeographical region of which is not known.

There are 244 plant taxons composed of species and subspecies levels in the flora list. Among 244 plant species listed in Flora list, 62 of them exist in Irano-Turanien element, 7 of them exist in European-Siberian element, 18 of them exists in East Mediterranean and 10 of them exist in Mediterranean element. 147 of them (remaining part) exist in cosmopolite and category of undetermined phytogeographical region.

Fauna

Among the fauna species present and likely to be present in the vicinity and impact area of AEATPP, amphibian species are given at Table 3.2.6.2, reptile species are given at Table 3.2.6.3, bird species are given at Table 3.2.6.4 and mammal species are given at Table 3.2.6.5. These tables are all given in the Annex B.12. of the report. Family of each specie, latine name, habitat, IUCN category, Red Data Book category and whether they are in Bern Convention Appendix-2 (fauna species under strict protection) or Appendix-3 (protected fauna species) lists are determined and given in tables. These species are found in Turkey, and are not impacted by the rehabilitation project. A (-) sign indicates that the species not given in Appendix-2 and Appendix-3 of Bern Agreement.

Furthermore, Decisions of Ministry of Environment and Forestry General Directorate of Protection of Nature and National Parks, 2005-2006 Hunting Period Central Hunting Commission came into force by 20.07.2005 dated and 25881 numbered Official Gazette Annex-1 (wild animals protected by Ministry of Environment and Forest), Annex-2 (hunting animals by protected species), Annex-3 (species that are permitted to be hunted at specific times by Central Hunting Commission) lists for bird and mammal species are stated at related tables.

Amphibians

3 amphibians are present and likely to be present in the project impact area. Two of amphibians are listed at Bern Appendix-2 and 1 amphibian is listed at Bern Appendix-3.

One amphibian (Hyla arborea arborea) among them is listed in IUCN, but they are abundant and widespread and not endangered in Turkey.

Reptiles

It is determined that 16 reptile species possibly exist in the project impact area, among these species 7 of them exist in Bern Appendix-2 list, 9 of them exist in Bern Appendix-3 list.

Among the reptile species, one species (*Testudo graeca ibera*) exists in IUCN list, but it is very abundant and widespread according to the study performed by Demirsoy (1996). Moreover, they are not endangered.

All reptile species exist in Appendix -1 list, that is "wild animals protected by Ministry of Environment and Forestry" of 2005-2006 Hunting Period Central Hunting Commission Decisions" that was come into force by 20.07.2005 date and 25881 number Official Gazette by Ministry of Environment and Forest.

Birds

It is determined that 72 bird species possibly exist in the project impact area, among these 47 of them exist in Bern Appendix -2 list, 18 of them exist in Bern Appendix -3 list.

49 bird species are listed at Annex-1 of Decisions of Ministry of Environment and Forestry General Directorate of Protection of Nature and National Parks, 2005-2006 Hunting Period Central Hunting Commission that was come into force by 20.07.2005 dated and 25881 numbered Official Gazette (wild animals protected by Ministry of Environment and Forest), 12 bird species are listed at Annex-2 (hunting animals by protected species), and 11 bird species are listed at Annex-3 (species that are permitted to be hunted at specific times by Central Hunting Commission) list.

There is no bird specie given in IUCN list.

Mammalia

It is determined that 20 mammalian species possibly exist in the project impact area, and 5 of them exist in Bern Annex-2 list and 6 of them exist in Bern Annex-3 list.

5 mammalian species are listed at Annex-1 of Decisions of Ministry of Environment and Forestry General Directorate of Protection of Nature and National Parks, 2005-2006 Hunting Period Central Hunting Commission that was come into force by 20.07.2005 dated and 25881 numbered Official Gazette (wild animals protected by Ministry of Environment and Forest), 2 mammalian species are listed at Annex-2 (hunting animals by protected species), and 3 mammalian species are listed at Annex-3 (species that are permitted to be hunted at specific times by Central Hunting Commission) list.

Among these mammalian species, 6 of them *(Cricetulus migratorius, Spalax leucodon, Vulpes vulpes, Rhinolophus ferrumequinum, Rhinolophus hipposideros, Sciurus anomalus)* exist in IUCN lists.

Among the species given in IUCN list, 4 of them (*Cricetulus migratorius, Spalax leucodon, Vulpes vulpes, Sciurus anomalus)* are included in "nt" category according to Demirsoy (1996). Species included in "nt" category are very abundant and widespread in Turkey, and they are not endangered.

Other two species *(Rhinolophus ferrumequinum ve Rhinolophus hipposideros)* included in IUCN list and one specie *(Pipistrellus pipistrellus)* not included in IUCN list exist in "V" category according to Demirsoy (1996). Species included in "V" category are the species which becoming extinct and will be extinct in the future if no precaution is taken.

One specie that is not included in IUCN list *(Canis lupus)* exists in R category according to Demirsoy (1996). Species included in "R" category are rare species.

For the species listed in Annex-2 and Annex-3 of Bern Convention, the protection measures and Article 6 and 7 of the Convention will be complied. These are presented below;

1- Regarding strictly protected species (Article 6);

- all forms of deliberate capture and keeping and deliberate killing;
- the deliberate damage to or destruction of breeding or resting sites;
- the deliberate disturbance of wild fauna, particularly during the period of breeding, rearing and hibernation, insofar as disturbance would be significant in relation to the objectives of this Convention;
- the deliberate destruction or taking of eggs from the wild or keeping these eggs even if empty;
- the possession of and internal trade in these animals, alive or dead, including stuffed animals and any readily recognizable part or derivative thereof, where this would contribute to the effectiveness of the provisions of this article.

2- Regarding protected fauna species (Article 7);

Measures to be taken shall include:

- closed seasons and/or other procedures regulating the exploitation;
- the temporary or local prohibition of exploitation, as appropriate, in order to restore satisfactory population levels;
- the regulation as appropriate of sale, keeping for sale, transport for sale or offering for sale of live and dead wild animals

3.2.7. Mines and Fossil Fuel Sources (reserve quantity, existing and planned operation activities, annual productions, and its importance and economic value for the country and local utilizations)

Afşin-Elbistan lignite reserve covers an area of almost 100 km^2 in between Afşin and Elbistan Districts, in the province of Kahramanmaraş. Lignite reserves were discovered as a result of the research conducted by Dr.İng Otto Gold firm, MTA and TKİ during 1967-1969 years. Approximately 850 drillings were conducted at this region during this period of time and mine borders and characteristics have been determined. This region has proven ore deposits of 3.4 billion tones. About 1.7 billion tons of this total reserve is usable capacity. The reserve occurs mainly in three sectors, namely, Çöllolar, Kışlaköy and Afşin sectors. The coal has been using for the Afşin-Elbistan Power Plants.

The following table shows the other mines found in Kahramanmaraş Province.

Table 3.2.7.1. Other Mines in Kahramanmaraş Province

Mine	Place	Tenor	Reserve (ton)
ASBESTOS (Asb)	Afşin-Malavı appearance	1% asbestos	Appearance
BARİT (Ba)	K.Maraş-Önsen-Bozağalık	97 (% $BaSO_4$) 97	41 344 visible 33376 visible +possible
	K.Maraş-Türkoğlu-Şekeroba	98.55 98.55	172 000 visible 290 000 possible
IRON (Fe)	Elbistan-Çakçak Stream Site	40-53% Fe	1 200 000 ton possible. No production.
	Elbistan-Çardak Site	52% Fe	150 000 ton visible reserves.
	Elbistan-Nargele Site	58% Fe Ther	No economical reserve
PHOSPHATE (P)	Pazarcık -Milyanlı appearance	0.8-19% P_2O_5	-
LIMESTONE (Kçt)	Afşin-Elbistan (Mırmırın Stream) Site	97%-98 $CaCO_3$, 0.1% 53 SiO_2, 0.50% MgO	584 231 ton visible +possible reserve. Used for raw material in power plants
	Afşin-Elbistan (Tepekuzu Sector)	, 0.10% SiO_2, 0.50 %MgO	49 421 077 ton visible +possible
	Keşanlı Stream Sector	Ayrı 0.1% SiO_2, 0.50% MgO	In addition, Küçük Kışla Sector, Karagöz Sector, Kutkayası Sector and Arıtat Sectors have known beds.
CHROME (Cr)	Merkez-Bolukçam Tepe Site	Massive Geç	30 000 ton ore have been produced in the past .
	Merkez-Hacıbebekli Site	- Yat	24 000 ton possible reserve
	Merkez-Battalgazi Site	38-50 %Cr_2O_3 Geç	13929 tons of ore have been produced in the past.
	Merkez-Balıkalan Site	-	30000 ton ore have been produced in the past.
Me	Merkez-Tavtan Tepe appearance	41% Cr_2O_3	-
	Merkez-Akyüz Quarry	-	Operated in the past
	Merkez-Dağdelen Site	46 % Cr_2O_3	2 500 ton possible
leaLEAD-ZINC (Pb-Zn)	Afşin-Tulavsun appearance	-	Appearance
	Merkez-Dadağlı appearance	galen and calcite	Appearance
	GökGoksun-Saraycık appearance	% 1-4 Cu, % 9 Pb	Appearance
MANGANESE (Mn)	Pazarcı-Zombo Site	% 38.04 Mn 20	2000 ton total reserve
BRICK-ROOF TILE (TğKi)	Türkoğlu-Pazarcık and Kıllı Village	good	59 000 000 ton possible reserve

Source: www.mta.gov.tr, 2005

3.2.8. Lands under Control and Responsibility of Authorized Governmental Agencies (Military Security Zones, Areas allocated for Governmental Agencies for Special Purposes, Restricted Lands specified by the Cabinet Decision No: 7/16349)

The lands of AEATPP, AEBTPP and lignite site of Kışlaköy are under control and responsibility of State.

3.2.9. Determination of Existing Pollution Load of the Region (air, water, soil and noise)

Surveys to record existing baseline environmental conditions were undertaken for Afsin-Elbistan A Thermal Power Plant rehabilitation area and its close vicinity between 2nd of February and 5th of April 2005. These environmental surveys covered the noise measurements, surface and groundwater sampling, air quality survey and soil pollution sampling. Air quality survey was also conducted May-July periods.

The scope of the work conducted in this region is the determination of the existing pollution level in the area. The air quality monitoring was conducted during two 60 day periods for a total duration of approximately four months while the other sampling and monitoring works were only conducted once. In addition to those studies there were no other previous baseline studies conducted in the region. Therefore, there were no previous data showing the environmental situation of the region before the power plant was put into operation and hence it is not possible to compare the existing situation with the previous one, so that the exact level of impact of the power plant on the environmental conditions of the area could not be determined. The findings of the analysis could only be compared and discussed with the regulations and with each other.

3.2.9.1. Baseline Noise Survey

Methodology

Noise survey was conducted on 4th - 13th of February 2005. Purpose of the survey is to collect the baseline data regarding the background noise levels in the vicinity of the Afşin-Elbistan A Thermal Power Plant. For this purpose 12 hours continuous noise measurements were conducted at 7 points.

Topographical obstacles in this area are the main attenuation factor in the noise transmission between the source and receptor. Wind, temperature and humidity are important meteorological factors, which might influence the measurement device thus the accuracy of the measurement results. In order to prevent such an influence, for example, due to wind blowing across the microphone, a special wind-screen consisting of a ball of porous polyurethane sponge was used over the microphone during measurements. In addition to that to prevent the humidity effect on measurement, sound level meter was located in a place protected from rain. Humidity levels up to 90% have no influence on the instrument. During the survey period, such meteorological conditions did not occur.

Vegetative cover in the measurement area is another noise attenuation factor in addition to the topographical and meteorological ones. For instance, it is known that noise level decreases 3 dB while transmitting through a highly dense vegetative (i.e., forest) cover with a width of 50 m.

Agricultural fields are main vegetative cover types around the power plant. There are some vegetative obstacles such as trees between the power plant and the noise measurement locations, but no significant effect of these obstacles are expected.

In establishing the noise measurement program, the following factors were taken into consideration for the environmental assessment:

- Significance of noise levels generated by the project activities,
- Existing noise sources near the project location, and
- Proximity of population centers sensitive to the project noise sources.

For this purposes seven noise measurement locations were selected in the vicinity of Afşin Elbistan A Thermal Power Plant that are the main receptors. The name and coordinates of locations are listed in Table 3.2.9.1.

Table 3.2.9.1. The Name and Coordinates of the Noise Measurement Locations

Measurement Locations	Location Name	GPS Coordinates	
		Easting	Northing
AEL Operation Directorate Office	Afşin GRLT 1	037° 02' 46.1"	038° 20' 29,3"
Alemdar 1	Afşin GRLT 2	037° 01' 52.9"	038° 21' 42.4"
Çoğulhan Social Activity Center	Afşin GRLT 3	037° 01' 01.4"	038° 21' 11.8"
Alemdar 2	Afşin GRLT 4	037° 01' 30.5"	038° 21' 41.5"
Çoğulhan 1	Afşin GRLT 5	037° 01' 08.5"	038° 20' 48.6"
Çoğulhan 2	Afşin GRLT 6	037° 01' 19.9"	038° 20' 25.0"
Gendarme	Afşin GRLT 7	037° 02' 03.3"	038° 20' 26.2"

Noise measurements were conducted by SVAN 943A sound level meter with measurement range between 26-133 dB. The equipment works in the principles according to the TS 8535 EN 60651 standards.

Sound level meter was located at least 1 m away from the reflecting surfaces for the measurement accuracy. Measurements were conducted for 12 hours continuously, average data were taken each 15 minutes intervals.

Result of Background Noise Measurement

The results of the measurements are listed in the following tables. The Leq is the equivalent SPL. The sound from noise sources often fluctuates widely during a given period of time. L_{eq} is the average of all SPL's measured during a period of time such as one hour. The L_{eq} value can be obtained directly with an integrating sound level meter.

Lmax indicates the highest SPL and L_{min} indicate the lowest SPL measured throughout the survey period at one location. The average noise level measurement results measured at each measurement location is given in Table 3.2.9.2 indicating Leq, Lmax and Lmin values.

Tablo 3.2.9.2 Average Noise Measurement Results

Average	L_{EQ}	MAX	MIN
GRLT 1 (AEL Operation Directorate Office)	45.5	63.1	39.7
GRLT 2 (Alemdar 1)	49.2	60.5	43.7
GRLT 3 (Çoğulhan Social Facilities)	61.5	80.4	47.2
GRLT 4 (Alemdar 2)	49.1	67.0	41.0
GRLT 5 (Çoğulhan 1)	60.8	77.4	50.7
GRLT 6 (Çoğulhan 2)	59.5	77.0	48.3
GRLT 7 (Gendarme)	50.7	69.0	42.5

Afşin GRLT 1 (AEL Operation Directorate Office)

Noise measurement at AEL Operation Directorate Office named as Afşin GRLT 1 was conducted on 4th of February 2005.

Afşin GRLT 2 (Alemdar 1)

Noise measurement at Alemdar 1 named as Afşin GRLT 2 was conducted on 5th of February 2005.

Afşin GRLT 3 (Çoğulhan Social Facilities)

Noise measurement at Çoğulhan Social Facilities named as Afşin GRLT 3 was conducted on 6th of February 2005.

Afşin GRLT 4 (Alemdar 2)

Noise measurement at Alemdar 2 named as Afşin GRLT 4 was conducted on 7th of February 2005.

Afşin GRLT 5 (Çoğulhan 1)

Noise measurement at Çoğulhan 1 named as Afşin GRLT 5 was conducted on 8th of February 2005.

Afşin GRLT 6 (Çoğulhan 2)

Noise measurement at Çoğulhan 2 named as Afşin GRLT 6 was conducted on 9th of February 2005.

Afşin GRLT 7 (Gendarme)

Noise measurement at Gendarme named as Afşin GRLT 7 was conducted on 10th of February 2005.

Discussion of Results of the Noise Survey

Baseline noise measurement results were compared with the World Bank standards and Regulation on Assessment and management of Environmental Noise. Limit values stated in these regulations are listed in the Table 3.2.9.3 and Table 3.2.9.4.

Table 3.2.9.3. World Bank Maximum Allowable Standards for Noise

	L_{eq} (dBA)	
	World Bank Maximum Allowable	
Receptor	Daytime 07.00-22.00	Night time 22.00-07.00
Residential, Institutional, Educational	55	45
Industrial	70	70
Commercial	70	70

According to the World Bank, noise abatement handbook an operating facility should achieve either the levels specified in the above table or if the baseline noise levels are already above those limits in the above table a maximum increase in the ambient noise level of 3 dBA is acceptable.

Table 3.2.9.4. Environmental Noise Limit Values for Industrial Plants

Areas	L_{day} (dBA)	L_{night} (dBA)
Industrial areas	70	60
Areas where industry and residences are together (mostly industry)	68	58
Areas where industry and residences are together (mostly settlement)	65	55
Rural areas and settlement areas	60	50

There is existing Afşin Elbistan A Thermal Power Plant to be rehabilitated, then average values were only compared with continuous industrial noise levels.

Average of the noise measurement results conducted at seven locations described above are given in Table 3.2.9.5. These seven locations represent all the nearest possible residential areas around the Afşin Elbistan A Thermal Power Plant.

Table 3.2.9.5. Measured Average Noise Levels in 7 Residential Areas around Power Plant

Measurement Locations	Location Name	Measured Average Values (in dB(A))		
		L_{EQ}	MAX	MIN
AEL Operation Directorate Office	Afşin GRLT 1	45.5	63.1	39.7
Alemdar 1	Afşin GRLT 2	49.2	60.5	43.7
Çoğulhan Social Facilities	Afşin GRLT 3	61.5	80.4	47.2
Alemdar 2	Afşin GRLT 4	49.1	67.0	41.0
Çoğulhan 1	Afşin GRLT 5	60.8	77.4	50.7
Çoğulhan 2	Afşin GRLT 6	59.5	77.0	48.3
Gendarme	Afşin GRLT 7	50.7	69.0	42.5

The Leq values measured around the Afşin Elbistan A Thermal Power Plant were in compliance with the maximum allowable values given by Regulation on Turkish Noise Control and the World Bank regulations.

3.2.9.2. Baseline Surface and Groundwater Survey

Water samples were taken from groundwater wells and surface water to determine the baseline physical and chemical characteristics of the water resources of the Project site within the context of surface and groundwater quality survey on 15th of February 2005.

Surface and ground water samples were taken around the Afşin-Elbistan A Thermal Power Plant at totally 6 points which are expected to be affected from project activities. Two of the wells were selected around the ash deposit area to determine the characteristics of the groundwater according to the parameters stated at "Regulation on Hazardous Waste" Annex11-A Table.

Sampling and analysis were conducted according to the TS ISO 5667 and TS 5106 ISO 5667-3 standards. Samples were analyzed to determine the water classification for pH, DO, Conductivity, TDS, Total Hardness, COD, BOD, NO3, NO3-N, F, Cl, CN, Zn, Cu, Fe, SO4, PO4-P, Mg, As. Samples taken from ash deposit area were also analyzed according to the parameters stated at Hazardous Waste Regulation Annex11-A Table.

Methodology and Water Sampling Locations

Totally 6 water sample locations were selected around the Thermal Power Plant. Surface water sampling locations were selected to be affected from the project activities and at the downstream of the discharge points. Groundwater sampling locations were selected in order to determine the baseline characteristics of the groundwater underlying the project site, and to observe any indication of past contamination resulting from power plant operations. Two ground water sampling locations were selected at the ash deposit area. Sampling locations are listed in the following Table 3.2.9.6.

Table 3.2.9.6. Sampling Locations of Surface and Ground Water

Sampling Locations	Location Name	GPS Coordinates	
		Easting	Northing
Internal Evacuation Area	SW 1	37°02'19,5"	38°21'57,4"
Tekerlek Creek (Downstream of the discharge point)	SW 2	37°02'22,8"	38°17'27,9"
Tekerlek Creek (Upstream of Hurman Creek)	SW 3	37°00'52,3"	38°23'18,2"
External Stock Area	GW 1	37°02'23,9"	38°21'07,9"
Internal Evacuation Area	GW 2	37°02'13,9"	38°20'25,5"
Emergency Stock Area	GW 3	37°02'18,2"	38°21'56,8"

Sampling procedures, sample preservation and storage techniques were carried out in compliance with Regulation on Water Pollution Control Sampling and Analysis Methods Guide prepared by Ministry of Environment and Forestry.

During groundwater sampling, if there is pump at wells, groundwater from wells fitted with pumps was sampled directly from the tap closest to the well head. However, bailer tubes were used for the sampling where there is no pump. Surface water sample was taken at a depth of at least 15 cm in the thalweg (deepest mid-stream). For the surface water sampling, bucket was dipped in to water wading to the upstream direction. During sampling special attention was paid not to disturb sediments.

pH, DO, TDS, Salinity and Conductivity of the samples were measured on site with the instrument Hach Sension 156. The equipment is the portable multi-parameter instrument measuring the above stated parameters by electrochemical method.

Water samples were taken into clean plastic containers. Before use sample containers were cleaned and kept away from contamination. Containers were rinsed with distilled water before sampling. Before sampling, decontaminated sampling buckets were flushed 2-3 times with sampled water at sampling point.

For ex-situ measurements samples were immediately capped and labelled before shipment. Samples were kept in dark at 2-5 oC.

Result of Water and Groundwater Analysis

Legislation

Quality of the water resources is determined incompliance with the Regulation on Water Pollution Control Table 1.

Turkish Regulation related to water quality is the Regulation on Water Pollution Control (RWPC) which is first published on 4th of September 1988 and republished on 31st of December 2004.

Quality of the water resources is defined in the RWPC (Table 1, Continental Water Resources Quality Class). This table states general four classes for water sources.

The classification and the usage areas for the surface waters are as follows:

Class 1 - Highest Quality Water:

a. Drinking water purposes after disinfection,
b. Recreational purposes, and
c. Animal and trout production.

Class 2 – Slightly Polluted Water:

a. Drinking water purposes after advanced treatment,
b. Recreational purposes,
c. Fish production except trout,
d. Purposes other than stated in class 1.

Class 3 -Polluted Water: Industrial purposes other than the food and textile industry requiring higher quality water.

Class 4 -Highly Polluted Water: Could only be used after proper treatment to improve the quality.

The classification and the usage areas for the ground waters are as follows: First three categories are taken into consideration for quality. Class 1 is used for drinking water purposes after proper disinfection and also for food industry. Class 2 is used for drinking purposes after treatment; this type of groundwater is used for irrigation and animal breeding. Class 3 is the lowest quality groundwater.

Results of analysis conducted in water samples are given in Table 3.2.9.7 Water quality class of each parameter in compliance with the RWPC dated 31st of December 2004 is given in the parentheses.

Table 3.2.9.7. Analysis Results of Water and Groundwater Sampling

SAMPLE	SW 1	SW 2	SW 3	GW 1	GW 2	GW 3
pH	8.16 (1-2)	10.87 (4)	9.65 (4)	7.92 (1-2)	7.83 (1-2)	8.34 (1-2)
DO (mg/l)	6.47 (2)	5.6 (3)	6.22 (2)	6.79 (2)	5.88 (3)	5.6 (3)
Conductivity (µohms/sec)	1289	709	819	497	600	516
TDS (mg/l)	710 (2)	384 (1)	446 (1)	268 (1)	325 (1)	278 (1)
COD (mg/l)	33 (2)	40.7 (2)	40.4 (2)	<5 (1)	<5 (1)	<5 (1)
BOD (mg/l)	3 (1)	0 (1)	0 (1)	<4 (1)	<4 (1)	0 (1)
NO_3 (mg/l)	3.4	9.51	10.7	37.2	14.5	22.4
NO_3^-N (mg/l)	0.765 (1)	2.14 (1)	2.42 (1)	8.43 (2)	3.27 (1)	5.07 (2)
Cl (mg/l)	0.137 (1)	0.217 (1)	0.24 (1)	0 (1)	0 (1)	0 (1)
Total Hardness (mg/l)	672	340	392	308	280	240
F (mg/l)	0.63 (1)	0.55 (1)	0.66 (1)	0.57 (1)	0.5 (1)	0.6 (1)
CN (mg/l)	<0.001 (1)	<0.001 (1)	<0.001 (1)	<0.001 (1)	<0.001 (1)	<0.001 (1)
Zn (mg/l)	<0.002 (1)	<0.002 (1)	<0.002 (1)	<0.002 (1)	<0.002 (1)	<0.002 (1)
Cu (mg/l)	<0.01 (1)	<0.01 (1)	<0.01 (1)	<0.005 (1)	<0.05 (1)	<0.01 (1)
Fe (mg/l)	<0.02 (1)	<0.02 (1)	<0.02 (1)	<0.02 (1)	<002 (1)	<0.02 (1)
Mg (mg/l)	13.76	4.54	8.2	4.33	3.12	6.36
SO_4 (mg/l)	166 (1)	106 (1)	106 (1)	$2.5*10^{-3}$ (1)	$5.9*10^{-3}$ (1)	12 (1)
PO_4^-P (mg/l)*	0.032 (2)	0.017 (1)	0.052 (2)	0.013 (1)	0.008 (1)	0.015 (1)
As (mg/l)	<0.002 (1)	<0.002 (1)	<0.002 (1)	<0.002 (1)	<0.002 (1)	<0.002 (1)

*Discussions have been conducted for total phosphorus.

As seen in the table most of the parameters for the surface and groundwater samples show the class 1 and 2 properties. The water samples taken from the ash deposit area (GW 1 and GW 2) were analyzed according to the Regulation on Turkish Hazardous Waste Control Annex11 A Table that is given in the Table 3.2.9.8.

Table 3.2.9.8. Regulation on Hazardous Waste Control Annex 11 A Table (14.03.2005 dated)

PARAMETER	Inert Waste (mg/l)	Non-hazardous Waste (mg/l)	Hazardous Waste (mg/l)
pH	-	-	
TOC	≤30000 (%3) (mg/kg)	50000 (% 5)-pH ≥ 6 (mg/kg)	60000 (%6) (mg/kg)
As (mg/l)	≤ 0.05	0.05–0.2	< 0.2–2.5
Cd (mg/l)	≤ 0.004	0.004 – 0.1	< 0.1–0.5
Cr^{+6} (mg/t)	-	-	-
Cu (mg/t)	≤ 0.2	0.2 – 5	< 5 – 10
Hg (mg/l)	≤ 0.001	0.001– 0.02	< 0.02– 0.2
CN (mg/l)	-	-	-
Ni (mg/l)	≤ 0.04	0.04 – 1	< 1 – 4
Pb (mg/l)	≤ 0.05	0.05 – 1	< 1 – 5
Ammonium gN/L	-	-	-
NO_3 (g/l)	-	-	-
Zn (mg/l)	≤ 0.4	0.4 -5	< 5 -20
Cl (g/l)	≤ 80 (mg/l)	80 - 1500 (mg/l)	< 1500 – 2500 (mg/t)
F (mg/l)	≤ 1	1 -15	< 15 -50
Sulfate (g/l)	≤ 100	100 – 2000	< 2000- 5000

Table 3.2.9.9 shows analysis results of GW 1 and GW 2 according to the Regulation on Turkish Hazardous Waste Control Annex11 A Table.

The analysis results given by Table 3.2.9.7 were compared with Regulation on Water Pollution. The analysis results for Regulation on Hazardous Waste Control are also below the limits of Regulation on Hazardous Waste Control. Therefore the existing activities have no negative impact on environment.

Table 3.2.9.9. Analysis Results of GW 1 and GW 2 according to the Regulation on Turkish Hazardous Waste Control Annex11 A Table

SAMPLE	GW 1	GW 2
pH	7.92	7.83
TOC (mg/l)	0.0875	1.252
As (mg/l)	<0.002	<0.002
Pb (mg/l)	<0.002	<0.002
Cd (mg/l)	<0.002	<0.002
Cu (mg/l)	<0.005	<0.005
Ni (mg/l)	<0.002	<0.002
Hg (mg/l)	<0.01	<0.01
Zn (mg/l)	<0.002	<0.002
Phenols (mg/l)	<0.001	<0.001
Cr+6 (mg/l)	<0.002	<0.002
F (mg/l)	0.57	0.5
Ammonium gN/L	$<0.05*10^{-3}$	$<0.05*10^{-3}$
Cl (g/l)	0	0
CN (mg/l)	<0.001	<0.001
NO_3 (g/l)	37.2	14.5
Sulfate (g/l)	$2.5*10^{-3}$	$5.9*10^{-3}$
Halogenous Organics (AOX) (mg/l)	0.065	0.072
Thinners and solvents (Cl/l)	<0.002	<0.002
Pesticides (µg Cl/l)	<0.2	<0.2
Soluble Matters in the Oil (mg/l)	0.088	0.081

3.2.9.3. Baseline Soil Contamination Survey

Baseline soil contamination survey was conducted in February 2005. The focus of this survey was the collection and subsequent analysis of the soil samples from the thermal power plant and its surrounding to determine the baseline soil conditions. Totally 10 soil samples were taken for the soil efficiency analysis (texture, salinity, pH, lime, phosphorus, potassium, organic matter), cation exchange capacity and chemical analysis (TOC, Total Nitrogen). 2 of the soil samples were taken from the ash deposit area to be analyzed according to the parameters stated at Regulation on Hazardous Waste Control Annex 11 A. There is no statement related to the baseline quality of soil. The Regulation on Soil Pollution Control dated 31st of May 2005, although there is no specific parameter for classification of existing soil quality the 8th item of the regulation states that the change in soil quality should have to be followed by documenting the baseline soil quality parameters of the region. In this respect, the following analyses have been conducted to document the existing soil quality of the region.

Methodology and Soil Sampling Locations

Soil samples were taken by a clean shovel. Totally 10 soil samples were taken from the project area. 2 of the soil samples were taken from ash deposit areas. One of the samples was taken into plastic container for soil efficiency analysis (texture, salinity, pH, lime, phosphorus, potassium, and organic matter), cation exchange capacity and chemical analysis (TOC, Total Nitrogen) and the other was taken into the glass jar for analysis to be conducted according to the Regulation on Hazardous Waste Control. The soil sample locations are listed in the Table 3.2.9.10.

Table 3.2.9.10. Soil Sampling Locations

SAMPLE	GPS COORDINATES	
	EASTING	NORTHING
AFŞİN TPR 1	37° 01' 55,5"	38° 21' 38,7"
AFŞİN TPR 2	37° 00' 27,4"	38° 20' 57,7"
AFŞİN TPR 3	37° 00' 40,7"	38° 20' 20,6"
AFŞİN TPR 4	37° 01' 19,1"	38° 20' 03,9"
AFŞİN TPR 5	37° 02' 12,8"	38° 20' 07,1"
AFŞİN TPR 6	37° 02' 51,5"	38° 20' 17,5"
AFŞİN TPR 7	37° 01' 02,2"	38° 21' 22,8"
AFŞİN TPR 8	37° 00' 55,8"	38° 23' 15,7"
AFŞİN TPR 9	37° 01' 44,8"	38° 22' 10,3"
AFŞİN TPR 10	37° 02' 21,0"	38° 21' 22,7"

Samples were taken from the soil surface, for this purpose 10-15 cm of soil was stripped to separate the vegetative cover, the plant roots and stones were totally cleaned. Then 5-6 kg soil sample was taken from each sampling point.

Results of the Soil Analysis

The result of soil efficiency analysis (texture, salinity, pH, lime, phosphorus, potassium, and organic matter), cation exchange capacity and chemical analysis (TOC, Total Nitrogen) which was conducted by Institute of Soil and Fertilizer Research is given in table below.

Table 3.2.9.11. Results of Soil Structure and Fertility Analysis

Parameter	Soil Sampling Locations									
	Afşin TPR 1	Afşin TPR 2	Afşin TPR 3	Afşin TPR 4	Afşin TPR 5	Afşin TPR 6	Afşin TPR 7	Afşin TPR 8	Afşin TPR 9	Afşin TPR 10
Texture (%)	54 CL	50 L	71 C	52 CL	55 CL	60 CL	49 L	62 CL	61 CL	55 CL
Salinity (%)	0.112	0.070	0.094	0.114	0.088	0.116	0.101	0.100	0.110	0.126
pH	7.92	7.99	7.95	7.95	7.94	7.92	8.13	7.84	7.89	7.94
Lime (%)	13.1	33.0	17.9	25.7	13.4	15.7	25.5	19.4	11.9	13.4
Phosphorus (kg/da)	2.8	2.8	6.9	9.6	3.7	2.1	2.8	0.9	0.8	1.4
Potassium (kg/da)	174	140	150	274	174	157	137	153	205	144
Organic Matter (%)	1.66	2.0	2.27	2.2	2.0	1.22	1.59	1.25	1.35	1.39
Cation Exchange Capacity (me/100 g)	31.58	23.10	32.60	29.28	27.07	34.40	31.65	32.54	34.99	29.60
TOC (mg/kg)	9623.2	11594.2	13159.4	12753.6	11594.2	7072.5	9217.4	7246.4	7826.1	8058.0
Total Nitrogen (%)	0.039	0.027	0.049	0.061	0.035	0.038	0.031	0.033	0.041	0.039

Table 3.2.9.12. Regulation on Hazardous Waste Control Appendix 11 A (dated 14.03.2005)

PARAMETER	Inert Waste (mg/l)	Non-hazardous Waste (mg/l)	Hazardous Waste (mg/l)
pH	-	-	
TOC	≤30000 (%3) (mg/kg)	50000 (% 5)-pH ≥ 6 (mg/kg)	60000 (%6) (mg/kg)
As (mg/l)	≤ 0.05	0.05–0.2	< 0.2–2.5
Cd (mg/l)	≤ 0.004	0.004 – 0.1	< 0.1–0.5
Cr^{+6} (mg/l)	-	-	-
Cu (mg/l)	≤ 0.2	0.2 – 5	< 5 – 10
Hg (mg/l)	≤ 0.001	0.001– 0.02	< 0.02– 0.2
CN (mg/l)	-	-	-
Ni (mg/l)	≤ 0.04	0.04 – 1	< 1 – 4
Pb (mg/l)	≤ 0.05	0.05 – 1	< 1 – 5
Ammonium gN/L	-	-	-
NO_3 (g/l)	-	-	-
Zn (mg/l)	≤ 0.4	0.4 -5	< 5 -20
Cl (g/l)	≤ 80 (mg/l)	80 - 1500 (mg/l)	< 1500 – 2500 (mg/l)
F (mg/l)	≤ 1	1 -15	< 15 -50
Sulfate (g/l)	≤ 100	100 – 2000	< 2000- 5000
Halogenous Organics (AOX) (mg/l)	-	-	-
Phenols (mg/l)	≤ 0.1	-	-

Two of the soil samples (TPR 8 and TPR 9) were taken from the ash deposit area to be analyzed according to the parameters stated at Regulation on Hazardous Waste Control Annex11 Table A. The results of the analysis are listed in the following Table 3.2.9.13.

Table 3.2.9.13. Analysis Results of TPR 8 and 9 according to the Regulation on Turkish Hazardous Waste Control Annex11 A.

SAMPLE	TPR 8	TPR 9
pH	7.84	7.89
TOC (mg/kg)	7246.4	7826.1
As (mg/l)	<0.002	<0.002
Pb (mg/l)	<0.002	<0.002
Cd (mg/l)	<0.002	<0.002
Cu (mg/l)	<0.005	<0.005
Ni (mg/l)	<0.002	<0.002
Hg (mg/l)	<0.01	<0.01
Zn (mg/l)	0.030	0.034
Phenols (mg/l)	<0.001	<0.001
Cr^{+6} (mg/l)	<0.002	<0.002
F (mg/l)	0.50	0.50
Ammonium gN/L	$0.40*10^{-3}$	$0.61*10^{-3}$
Cl (g/l)	4.10	5.49
CN (mg/l)	<0.001	<0.001
NO_3 (g/l)	0.033	0.033
Sulfate (g/l)	$13.0*10^{-3}$	$2.1*10^{-3}$
Halogenous Organics (AOX) (mg/l)	0.085	0.098
Thinners and solvents (Cl/l)	<0.002	<0.002

SAMPLE	TPR 8	TPR 9
Pesticides (µg Cl/l)	<0.2	<0.2
Soluble Matters in the Oil (mg/l)	0.131	0.148

The limit values stated at Table 3.2.9.12 are related to regular waste storage facilities for hazardous wastes (Annex-11A of Regulation on Hazardous Waste Control). Soil analyses results and the regulation values given by Table 3.2.9.12 and Table 3.2.9.13 show that existing facilities have no impact on the soils.

3.2.9.4. Baseline Air Quality Survey

Baseline air quality measurement was conducted for Afsin-Elbistan A Thermal Power Plant rehabilitation area and its close vicinity between 2nd of February and 5th of April 2005 to establish current levels of air quality and to calibrate air quality model that would subsequently be used to estimate the change of air quality due to the activities for the Afşin-Elbistan A Thermal Power Plant Rehabilitation Project. Measurements were conducted at 10 locations. 2 measurements were performed at the dominant wind directions on the nearest sensitive receptors to the Afşin-Elbistan A Thermal Power Plant along the long term dominant wind directions, and remaining 8 measurements were conducted at locations in project impact area as specified in Regulation on Air Quality Protection item 40 a-1. According to the same Regulation item 40 g, if the passive diffusion tube sampling method will be applied for monitoring of air quality, 8 sampling points should be decided on the minimum 8 points selected on the main wind directions. In compliance with the above stated item 10 sampling points was decided. During each monitoring period, at each location, three samples were taken, each representing a twenty dat average.

During activities of the project, there will be various air pollutants released into the atmosphere in varying amounts. The magnitude of impacts of these air pollutants will depend on factors such as pollutant emission rates, source characteristics, meteorology, topography, and land use. After existing levels of air pollutants determined in order to establish a baseline for these anticipated impacts, the operational phase air pollutions would be determined.

The pollutants that were the focus of this air quality survey are PM_{10}, HF, HCl, NOx and SO_2. Fractions of the suspended particulate matters with aerodynamic diameters less than 10 micrometers (PM_{10}) are of main concern because of their strong correlation with human health effects. In this survey, existing ambient PM_{10} levels were surveyed at ten sampling points in the vicinity of the existing Afşin-Elbistan A Thermal Power Plant.

NOx and SO_2 are two of the primary air pollutants of combustion. Therefore at ten sampling points in the vicinity of the existing Afşin-Elbistan A Thermal Power Plant site also were selected for NO_X and SO_2 analysis. The passive diffusion tubes were used for these pollutants.

Hydrogen Fluoride (HF) and Hydrogen Chloride (HCl) are air toxics. Exposure to these compounds cause health problems including cancer. Ten sampling points in the vicinity of the existing Afşin-Elbistan A Thermal Power Plant site also were selected for HF and HCl analysis. The passive diffusion tubes were used for these pollutants.

Measurement Locations

The air quality survey was conducted at ten sampling points in the vicinity of the existing Afşin-Elbistan A Thermal Power Plant. 2 measurements were performed at nearest sensitive receptor to the Afşin-Elbistan A Thermal Power Plant along the long term dominant wind directions, and remaining 8 measurements were conducted at basic 8 directions. Name and locations of the air quality measurement locations are listed in the following table. The determination of the air quality sampling points in compliance with the item 40 of the Regulation on Industrial Air Pollution Control has been conducted by determination of a circle having a radius of 50 times the stack height as the area of impact. 8 points HK 1, HK 2, HK 3, HK 4, HK 5, HK 6, HK 7, and HK 8 has been selected as the points that are close to the residential areas on 8 directions within the area of impact. HK 9 and HK 10 are decided as the points close to the residential areas on the main wind direction.

Table 3.2.9.14. Measurement Locations

Measurement Locations	Location Name	GPS Coordinates	
		Easting	Northing
Alemdar	HK 1	37°01'40,2"	38°21'45,2"
Kışlaköy	HK 2	37°05'29,8"	38°21'07,4"
Kuşkayası	HK 3	37°02'46,1"	38°17'00,7"
Çoğulhan	HK 4	37°00'22,4"	38°20'47,7"
AEL Stock Area	HK 5	37°02'55,1"	38°21'32,3"
Corridor area	HK 6	37°03'40,1"	38°19'01,2"
Çoğulhan Municipality Building	HK 7	37°00'59,2"	38°20'30,2"
Çoğulhan Social Facilities	HK 8	37°00'56,2"	38°21'24,4"
İğdem	HK 9	36°59'58,3"	38°18'39,3"
AEL Operation Directorate Office	HK 10	37°02'46,4"	38°20'30,1"

Regulations for Ambient Air Quality

Air quality standards and guidelines for ground level concentrations listed in the Turkish Regulation, WHO Guidelines and USEPA Standards (Pollution Prevention and Abatement Handbook World Bank Group Effective Since July 1998) are tabulated in Table 3.2.9.15.

The Regulation on Air Quality Protection article 6 provides the limit values for various parameters. The regulation requires that the short term (ST) limit value should not be exceeded by more than 95% of all the measurement results of the daily average values. Since only twenty day averages were available with the diffusion tube measurements, the ST or daily average values were estimated by air quality modeling. The ISCST3 model developed by the USEPA and which has been adopted as the international standard for multiple point sources modeling of air quality impacts from tall stack emissions was used to estimate ST values of air quality parameters (dust, SO_2, and NO_X). The definition of LT is stated in the regulation as the value that should not be exceeded by the arithmetical average of all measurement results.

In the following table the NOx values are stated in the form of NO as described in the regulation. On the other hand, World Bank, WHO Guidelines and US EPA Guidelines were all incorporated as NO_2. In addition to that passive diffusion tube results have been given as NO, NO_2 and NOx, there is no need for any conversion.

Table 3.2.9.15. Air Quality Standards

Standard/ Guideline		Turkish RAPC Standards[a]	World Bank Classification[b]	WHO Guidelines[c]	USEPA Standards[d]
SO_2	LT	150	100 (poor airshed) 80 (moderate airshed)	50	80
	ST	400 (95%) 900 (hourly)	150 (poor airshed) 150 (moderate airshed)	125	
NOx (as NO_2)	LT	100 (as NO_2)	100 as NO_2	40 as NO_2	100 as NO_2
	ST	300 (as NO_2) (95%)	150 (poor airshed) 150 (moderate airshed) as NO_2		
PM_{10}	LT	150	50	50	
	ST	300(95%)		125[e]	
HCl	LT	100			
	ST	300(95%)			
HF	LT	-			
	ST	10 (30)[f]			

LT: Long-term values (the average value of all the measurements)
ST: Short Term values (95% of the measurement values should be less than the stated value)
a 'Turkish Regulation on Air Quality Protection, 1986
b World Bank Group, 'Pollution Prevention and Abatement Handbook', 1998
c Guideline values in the 'WHO Guidelines for Air Quality', Geneva, 2000
d U.S.EPA Standards dated 1982 and the relevant addenda.
e Guideline values for combined exposure to sulfur dioxide and particulates.
f Max hourly limit value

Particulate Matter Survey

Methodology

PM_{10} sampling was conducted at 10 sampling points for duration of 24 hours for 6 days at each location using portable low-volume sampler in compliance with TS 2361 standard.

The ambient PM_{10} levels were surveyed by means of a filtration technique commonly employed by many regulatory agencies worldwide. A low-volume sampler was used for the current survey. The low-volume sampler pulls in air at a rate of 5 litres-per-minute (lpm) through an impactor designed to segregate SPMs larger than 10-μm in aerodynamic diameter. SPM is smaller than 10-μm pass through the impactor unhindered, consecutively to be retained on a 47-mm fibre-film filter.

At the beginning of the sampling, the sampler flow rate was calibrated using a transfer orifice traceable to U.S. National Institute of Standards and Technology (NIST). The sampler works on the basis of pulling ambient air through a 47-mm filter. A particle impactor with a cut-point diameter of 10 μm removes larger particles from the incoming air stream before reaching the filter. Difference in filter weight divided by the volume of collected air gives the ambient PM_{10} concentration. The filters shall be weighed using an analytical balance with a sensitivity of 0.0001 grams or better. This method will yield PM_{10} concentrations with a sensitivity of 1 μg/m^3.

PM_{10} Monitoring Methodology

PM_{10} sampling was conducted using Airmetric's Minivol portable low-volume sampler. The sampler works on the basis of pulling ambient air through a 47-mm filter for a period of 24 hours. A particle impactor with a cut-point diameter of 10 μm removes larger particles from the incoming air stream before reaching the filter. Difference in filter weight divided by the volume of collected air gives the ambient PM_{10} concentration. The filters shall be weighed using an analytical balance with a sensitivity of 0.00001 grams or better. This method yields PM_{10} concentrations with a sensitivity of 1 μg/m^3. The sampling wasl conducted respectively at every sampling point.

Sampling Duration

In general, the sampling duration is determined depending on the current air quality of the region to be monitored.

Result of Particulate Matter Survey

Result of the particulate matter survey is listed in table below.

Table 3.2.9.16. Result of Particulate Matter Survey

DATE	LOCATION	PM_{10} ACTUAL AVG. CONC. (μg/m^3)	Regulation on Air Quality Protection	
			ST (μg/m^3)	LT (μg/m^3)
04, 14, 24 Feb., 6, 16, 26 March	HK 10	31.37	300	150
05, 15, 25 Feb., 7, 17, 27 March	HK 5	83.50	300	150
06, 16, 26 Feb, 8, 18, 28 March	HK 8	42.60	300	150
07, 17, 27 Feb., 9, 19, 29 March	HK 2	24.85	300	150
08, 18, 28 Feb., 10, 20, 30 March	HK 9	24.98	300	150
09, 19 Feb., 1, 11, 21, 31 March	HK 6	34.18	300	150
10, 20 Feb. 2, 12, 22 March, 1 April	HK 4	47.08	300	150
11, 21 Feb., 3, 13, 23 March, 2 April	HK 7	135.13	300	150
12, 22 Feb., 4, 14, 24 March, 3 April	HK 1	72.65	300	150
13, 23 Feb., 5, 15, 25 March, 4 April	HK 3	64.01	300	150

The PM_{10} measurement period was 24 hours at one location. The measurements were repeated for 6 periods at each location for this reason, the values stated at Table 3.2.9.16 was compared with the short term limit values and the 6 period's average value was compared with the long term average values.

The long term limits are the values which are the average of the whole measurement results. For this reason, the averages of the on are calculated and compared with the long term limits.

Short term limit values are the values that correspond to the 95% of the measurement results when measurement results are sorted out. In this study the measurement results were sorted in a descending order and the 95 percentile value was compared with the short term limit value.

As it can be detected from the Table 3.2.9.16 the measured PM_{10} concentrations are in compliance with the LT and ST limit values.

In addition to that the existence of particulate matter problem around Afşin-Elbistan A Thermal Power Plant is obvious with the field observations. The particulate matter is classified as settleable (large particulates) and PM_{10}. In this project usually settleable large particulate problem is significant which is also supported by the field observations. The public complaints about the particulate problem is also very much. The measurements were based on the measurement of PM_{10} since it has a health hazard risk but the other particulates are the main problem. The measured values for PM_{10} could be accepted as inadequate when the total area is considered. But this measurement results should be accepted as a reference for future and measurements should be conducted regularly on the long term.

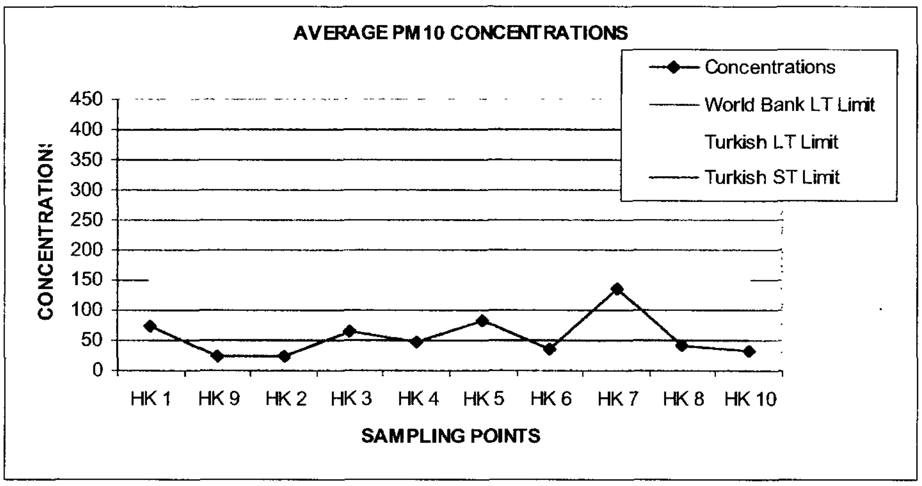


Figure 3.2.9.1. Result of the PM_{10} Measurement

NOx, SO_2, HF and HCl SURVEY

Methodology and Sampling Locations

Ambient concentrations of atmospheric pollutants (SO_2, NOx, HF, HCl) was surveyed using diffusion tube sampling methodology. These samplers consist of small plastic tubes, approximately 7 cm long with about 1 cm internal diameter. The storage time for the diffusion tubes is 12 weeks after preparation to analysis. At site and during transport, the storage conditions shall be kept as cool as possible without refrigeration (i.e. heat insulated boxes shall be used).

The same sampling points with PM_{10} equipped with passive diffusion tubes for total of 60 days. Survey was continued during all the 20 days for each sampling points, and the 6 periods were completed in that way. Thus, the survey was completed in 120 days. The laboratory analysis followed that period. All tubes sent to a laboratory in UK accredited laboratory of GRADKO, and instrumental analysis for each tube was conducted.

NO_X AND SO_2 MONITORING METHODOLOGY

NO_X and SO_2 Diffusion Tube Samplers

Ambient concentrations of NO_X and SO_2 will be measured using diffusion tube sampling methodology. These samplers consist of small plastic tubes, approximately 7 cm long with about 1 cm internal diameter (see in Figure 3.2.9.2 and Figure 3.2.9.3).

During sampling, one end of the tubes will remain open to air and the other will be closed. The NO_X and SO_2 tubes are differentiated by the color of their upper caps. The closed ends contain an absorbent for the gaseous species to be monitored (in this case NO_X and SO_2), and the samplers operate on the principle of molecular diffusion. The tubes will be mounted on pylons or masts as shown in the figures below:

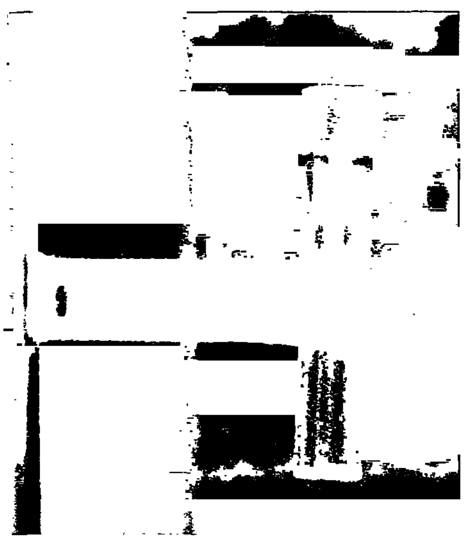


Figure 3.2.9.2. NO_X Diffusion Tube

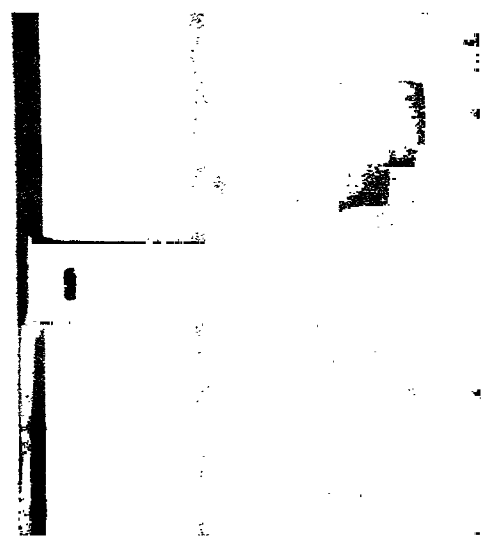


Figure 3.2.9.3. SO_2 Diffusion Tube

Table 3.2.9.17. Measurement Range of the NO_X and SO_2 Tubes

Parameters	Minimum (µg/m^3)	Maximum (µg/m^3)
NO_X	2.1	10,000.0
SO_2	2.8	11,500.0

Triethanolamine (TEA) has been shown to be a suitable NO_X absorber for use in the diffusion tubes. Stainless steel mesh discs are coated with absorber by either dipping into solution of TEA and acetone or pipeting a small quantity of the aqueous solution onto the discs in the assembled tube. The impregnated mesh discs are held at the closed ends of the tubes. The closed ends of the tubes are sealed and the tubes are stored prior to exposure. The caps are removed immediately before exposure period and NO_X is allowed to diffuse through the tubes. After completion of exposure, the caps are placed again and the tubes are sent to the laboratory for analysis.

The absorbent used for SO_2 tubes is, potassium hydroxide in glycerol solution placed on the closed end of the tubes. The other ends will be covered with another cap containing a filter to prevent any kind of acidic particulate matter that can contaminate the samplers. The tubes will be then stored in plastic bottles. The tubes will be removed from the plastic bottles immediately before exposure and left without removing the filter. After exposure period (one month), the tubes will be placed into their plastic bottles and sent to the laboratory for analysis.

The storage time for the NO_X and SO_2 tubes is 12 weeks after preparation to analysis. At site and during transport, the storage conditions shall be kept as cool as possible without refrigeration (i.e. heat insulated boxes shall be used).

Sampling Duration

In general, the sampling duration is determined depending on the current air quality of the region to be monitored. If the region of concern is a rural area and a significant pollution level is not expected, a sampling duration of 30 days is possible to be applied. If the monitored area is around an industrial source(s) or it is expected that the monitoring parameters of interest already exist in the ambient air, then, a sampling duration of 20 days was preferred.

Laboratory Analysis

After 20 days exposure period, the NO_X tubes are sent to the laboratory with bottom ends closed and in an airtight bag. NO_X is extracted from the absorbent and the extract is analyzed by U.V. Spectrophotometer to obtain the amount of nitrite (NO_X^-) in µg. The concentration of NO_X in the environment (in µg/m^3) is be calculated accordingly using the mass of nitrite determined in µg, exposure time and diffusion coefficient of the gas.

The SO_2 tubes are brought to the analysis laboratory in their plastic bottles and analyzed for sulfate (thus S in µg) by Ion Chromatography. The ambient concentration of SO_2 is calculated accordingly using the amount of sulfate (SO_4^{-2}), exposure time and diffusion coefficient of SO_2.

NOx Survey

Nitrogen oxides, or NOx, are the generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. Many of the nitrogen oxides are colorless and odorless. However, one common pollutant, nitrogen dioxide (NO_2) along with particles in the air can often be seen as a reddish-brown layer over many urban areas.

Nitrogen oxides form when fuel is burned at high temperatures, as in a combustion process. The primary manmade sources of NOx are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels. NOx can also be formed naturally.

NO and NO_2 were sampled to determine the nitrogen oxides. Measured NOx concentrations were listed in table below. Short term limit values are the maximum average daily values. Tubes were exposed to ambient air for 20 days in each period.

Table 3.2.9.18. Measured NO_x Concentrations

	Location	Order	Conc.(ug/m^3) 20 Days Period (average daily)			Regulation on Air Pollution Control Short Term Value	
			NO	NO_2	NOx	NO	NO_2
04.02.2005-24.02.2005	HK 1	1	3.23	4.24	7.47	600	300
	HK 2	1	4.41	1.95	6.37	600	300
	HK 3	1	7.47	2.21	9.68	600	300
	HK 4	1	1.95	2.63	4.58	600	300
	HK 5	1	2.63	2.29	4.92	600	300
	HK 6	1	3.90	2.04	5.94	600	300
	HK 7	1	4.50	5.60	10.10	600	300
	HK 8	1	0.34	3.48	3.82	600	300
	HK 9	1	3.31	2.21	5.52	600	300
	HK 10	1	5.35	3.31	8.66	600	300
24.02.2005-16.03.2005	HK 1	2	493.71	5.43	499.15	600	300
	HK 2	2	<LOD	2.46	2.04	600	300
	HK 3	2	52.38	3.48	55.86	600	300
	HK 4	2	<LOD	3.31	3.06	600	300
	HK 5	2	0.42	3.82	4.24	600	300
	HK 6	2	68.76	4.67	73.43	600	300
	HK 7	2	3.90	5.94	9.85	600	300
	HK 8	2	1.61	4.58	6.20	600	300
	HK 9	2	0.17	2.89	3.06	600	300
	HK 10	2	0.68	2.63	3.31	600	300
16.03.2005-05.04.2005	HK 1	3	0.00	3.67	2.13	600	300
	HK 2	3	0.00	1.88	1.02	600	300
	HK 3	3	LOST	0.26	LOST	600	300
	HK 4	3	0.00	2.31	0.77	600	300
	HK 5	3	0.00	3.59	0.26	600	300
	HK 6	3	0.00	3.33	1.62	600	300
	HK 7	3	0.00	3.42	2.90	600	300
	HK 8	3	0.00	4.78	0.60	600	300
	HK 9	3	0.00	2.99	0.77	600	300
	HK 10	3	0.00	2.65	1.11	600	300

The analysis results shown by the table are below the short term limits listed by Table 3.2.9.15. At the HK1 sampling point, during the measurement period 24.02.2005-16.03.2005 the measured 493.71 μg/m^3 value is a very high value compared to the other periods. The reason for this high concentration is possibly a huge instant NOx secondary emission or a possible contamination during the transportation or analysis of the tubes in GRADKO Laboratories. Still this measurement value is under the ST limit value of 600 μg/m^3. During the same measurement period the NO concentrations at HK 3 and 6 show similar increasing trends compared to the other periods. The locations of HK 1, 3 and 6 does not show a similarity when compared with each other to explain the similar increasing trends. In this case this situation could be explained with the meteorological parameters, such that by the effect of meteorology the concentrations might be carried up to the mixing layer height during the other periods and they were carried to further points and during this time period some of them might be downwashed and created some expected concentrations. Inversion might be the effecting downwash process for the pollutants.

Average concentrations of three periods are listed in the table below.

Table 3.2.9.19. Averages of Three Measurements

Location	Concentration (µg/m^3)			Regulation on Air Quality Protection Long Term Limit Values	
	NO	NO_2	NOx	NO	NO_2
HK 1	165.65	4.45	169.58	200	100
HK 2	1.47	2.10	3.14	200	100
HK 3	29.93	1.98	32.77	200	100
HK 4	0.65	2.75	2.80	200	100
HK 5	1.02	3.23	3.14	200	100
HK 6	24.22	3.35	27.00	200	100
HK 7	2.80	4.99	7.62	200	100
HK 8	0.65	4.28	3.54	200	100
HK 9	1,16	2,70	3,12	200	100
HK 10	2,01	2,86	4,36	200	100

Nitrogen oxide concentrations were in compliance with long term limit values. But the concentration observed at HK 1 for NO is due to the measurement result explained at the previous paragraphs. This high value affected the averages also.

SO_2 Survey

Sulfur dioxide, or SO_2, belongs to the family of sulfur oxide gases (SOx). These gases dissolve easily in water. SO_x gases are formed when fuel containing sulfur, such as coal and oil, is burned, and when gasoline is extracted from oil, or metals are extracted from ore. SO_2 dissolves in water vapor to form acid, and interacts with other gases and particles in the air to form sulfates and other products that can be harmful to people and their environment.

Depending on the sulfur content of the coal burned in the project, the effects mentioned above could be observed at the close vicinity (0-2 km) or a distant apart (2-10 km). Since the stack height is long it could be expected to have a longer range of transport for the thermal power plants.

SO_2 was first measured at 10 sampling points around Afşin-Elbistan A Thermal Power Plant between 2nd of February and 5th of April 2005. The results of the measurement are listed in the Table 3.2.9.20.

Table 3.2.9.20. Measured SO_2 Concentrations between 2nd of February and 5th of April 2005

Date	Location	Order	Concentration (ug/m³) 20 Days Period (average daily)	Regulation on Air Quality Protection ST Limit
04.02.2005-24.02.2005	HK 1	1	13.19	400
	HK 2	1	4.82	400
	HK 3	1	6.09	400
	HK 4	1	5.07	400
	HK 5	1	4.82	400
	HK 6	1	6.34	400
	HK 7	1	11.16	400
	HK 8	1	4.57	400
	HK 9	1	3.81	400
	HK 10	1	5.33	400
24.02.2005-16.03.2005	HK 1	2	49.73	400
	HK 2	2	3.04	400
	HK 3	2	10.40	400
	HK 4	2	4.06	400
	HK 5	2	5.84	400
	HK 6	2	7.87	400
	HK 7	2	6.34	400
	HK 8	2	5.58	400
	HK 9	2	2.03	400
	HK 10	2	3.81	400
16.03.2005-05.04.2005	HK 1	3	12.43	400
	HK 2	3	6.34	400
	HK 3	3	8.12	400
	HK 4	3	5.84	400
	HK 5	3	6.34	400
	HK 6	3	10.66	400
	HK 7	3	5.33	400
	HK 8	3	6.85	400
	HK 9	3	12.69	400
	HK 10	3	10.40	400

Second phase SO_2 measurement was conducted at the same sampling points around Afşin-Elbistan A Thermal Power Plant between 18th of May and 17th of July 2005. The results of the measurement are listed in the Table 3.2.9.21.

Table 3.2.9.21. Measured SO_2 Concentrations between 18th of May and 17th of July 2005

Date	Location	Order	Conc.(ug/m³) 20 Days Period (average daily)	Regulation on Air Quality Protection ST Limit
18.05.2005-07.06.2005	HK 1	1	29.43	400
	HK 2	1	12.43	400
	HK 3	1	16.49	400
	HK 4	1	21.31	400
	HK 5	1	14.97	400
	HK 6	1	21.31	400
	HK 7	1	30.45	400
	HK 8	1	30.45	400
	HK 9	1	14.72	400
	HK 10	1	23.60	400
07.06.2005-27.06.2005	HK 1	2	13.19	400
	HK 2	2	1.01	400
	HK 3	2	12.18	400
	HK 4	2	9.39	400
	HK 5	2	7.87	400
	HK 6	2	10.66	400
	HK 7	2	7.10	400
	HK 8	2	15.73	400
	HK 9	2	9.89	400
	HK 10	2	12.43	400
27.06.2005-17.07.2005	HK 1	3	5.84	400
	HK 2	3	2.54	400
	HK 3	3	3.55	400
	HK 4	3	5.07	400
	HK 5	3	3.30	400
	HK 6	3	2.28	400
	HK 7	3	3.55	400
	HK 8	3	9.39	400
	HK 9	3	3.04	400
	HK 10	3	4.31	400

As seen in Table 3.2.9.21, slight decrease was observed in SO_2 concentrations between 27th of June and 17th of July 2005. Afşin Elbistan A Thermal Power Plant was not operated between 3rd and 13th of July 2005 according to the official capacity report of the plant which may explain the difference.

For two phases of the measurements, there were 6 periods each was 20 days. The dominant wind direction of the winter measurement is NNW, the second periods' is SSW, and third period's is SSW. For the summer period, the dominant wind direction during the first period is SW, for the second period is NNW and the third period's is NNW.

Around HK 1 station there is a long term SO_2 measurement station of EUAŞ which was established by TÜBİTAK-MAM. This station has been conducting hourly SO_2 measurements. The results of the available measurements conducted in EUAŞ station in

Alemdar within the period which the passive sampling tubes was used is listed in the following tables.

Table 3.2.9.22. Available Measurement Results of EUAŞ Station in Alemdar

Month	Day	Average (ug/m^3)	Month	Day	Average (ug/m^3)
3	16	11	3	27	145
3	17	4	3	28	133
3	18	0	3	29	85.68
3	19	5	3	30	65
3	20	11	3	31	28
3	21	48	4	1	18
3	22	34	4	2	5
3	23	2	4	3	2
3	24	31	4	4	1
3	25	6	4	5	52
3	26	80			
TOTAL AVERAGE:					**36.5(ug/m^3)**

Table 3.2.9.23. Available Measurement Results of EUAŞ Station in Alemdar

Month	Day	Average (ug/m^3)	Month	Day	Average (ug/m^3)
5	25	0.000	6	22	3.438
5	26	7.478	6	23	2.938
5	27	5.646	6	24	16.191
5	28	3.250	6	25	3.617
5	29	7.292	6	26	1.438
5	30	8.178	6	27	2.234
5	31	7.979	6	28	46.771
6	01	12.667	6	29	31.000
6	02	12.208	6	30	0.128
6	03	7.458	7	01	0.106
6	04	8.000	7	02	0.085
6	05	5.800	7	03	0.283
6	06	4.971	7	04	0.723
6	07	28.000	7	05	0.766
6	08	9.042	7	06	0.083
6	09	31.583	7	07	0.191
6	10	7.313	7	08	0.660
6	11	116.000	7	09	1.149
6	12	0.104	7	10	2.021
6	13	0.563	7	11	2.188
6	14	32.042	7	12	0.896
6	15	25.125	7	13	2.125
6	16	0.104	7	14	16.204
6	17	2.792	7	15	34.522
6	18	12.551	7	16	7.500
6	19	7.021	7	17	2.188
6	20	4.745	7	18	31.896
6	21	2.229	7	19	0.000
TOTAL AVERAGE:					**10.4 (ug/m^3)**

Average concentrations of three periods during two measurement phases and averages of all measurements are listed in the Table 3.2.9.24.

Table 3.2.9.24. Averages of Three Measurements

Location	HK1	HK2	HK3	HK4	HK5	HK6	HK7	HK8	HK9	HK10
Average Concentration at First Phase ($\mu g/m^3$)	25.12	4.73	8.20	4.99	5.67	8.29	7.61	5.67	6.18	6.51
Average Concentration at Second Phase ($\mu g/m^3$)	16.15	5.33	10.74	11.92	8.71	11.42	13.70	18.52	9.22	13.45
Averages of all Measurements ($\mu g/m^3$)	20.64	5.03	9.47	8.46	7.19	9.85	10.66	12.10	7.70	9.98
Regulation on Air Quality Protection (LT Limits)										
LT Limit ($\mu g/m^3$)	150									

Slight increase was observed in summer time measurements. During the summer time measurement power plant was operated at ¼ of design load, like winter measurement. Although during the winter time residential areas might cause an extra SO_2 load, small increase in SO_2 concentration was observed during the summer time measurement.

As it is stated by TS EN 13528 Standard, wind has the effect on diffusion tubes. During the winter time wind velocity is generally higher than the summer time. Due to the high wind velocity, absorbation rate of passive diffusion tubes might be decreased during winter, however, in the summer time wind speed will decrease causing increase in absorbation rate of diffusion tubes. As stated in TS EN 13528 standard, wind effect is approximately 10 % on the measured concentration of SO_2.

Buoyancy force is the most important parameter affecting the plume rise. As seen from the following formula buoyancy force decreases when atmospheric temperature increases. Then high buoyancy force is expected during winter, pollutants rises at higher elevations.

$F_B=g((T_{STACK}/T_{AMB})-1)$ Buoyancy Formula

F_B : Buoyancy Force

g : Gravitational Acceleration

T_{STACK} : Stack Temperature

T_{AMB} : Atmospheric temperature

During the winter time, temperature difference between stack and atmosphere is higher than the summer time. Then emissions may rise to higher elevations in the atmosphere in winter. Since the buoyancy force on pollutants is higher and stack height is high, it might be transported above the mixing layer height and longer transport of pollutants may occur. On the other hand, summer time temperature difference between stack and atmosphere is smaller than winter time. Due to the buoyancy effect, pollutants would not pass the mixing height or partly pass. In summer there is no SO_2 effect from residential areas. The values given in Table 3.2.9.21 are resulted from thermal power plant.

Dominant wind direction varies during time of measurements conducted at different phases. Similar values are observed for two phases as seen in Table 3.2.9.23 at different locations. Therefore, the effect of dominant wind direction on transportation of pollutants could not be observed clearly.

As a result of the analysis conducted, the results of the ambient SO_2 measurements indicate that the Afsin-Elbistan A Thermal Power Plant as it currently operates (at reduced capacity) and after it will be rehabilitated and operated at full capacity are in compliance with the Turkish ST and LT air quality standards. First phase air quality measurements conducted during the winter period (February, March and early April), second phase air quality measurements conducted during spring-summer period (May, June and July) and the results of continuous SO_2 measurement station of EÜAŞ reflecting reduced capacity operation of the plant show that both the short term and long term SO_2 concentrations are in compliance with the regulation.

HF and HCl SURVEY

Hydrogen Fluoride (HF) and Hydrogen Chloride (HCl) are the air toxics. Exposure to these compounds cause health problems including cancer. Ten sampling points in the vicinity of the existing Afşin-Elbistan A Thermal Power Plant site were selected for HF and HCl analysis. The result of the measurement is listed in Table 3.2.9.25.

Table 3.2.9.25. List of the Results of Measurements

Date	Location	Order	Conc.(µg/m³) 20 Days Period		Regulation on Air Quality Protection (ST Limits) (µg/m³)	
			HF	HCl	HF	HCl
04.02.2005-24.02.2005	HK 1	1	10.65	0.55	10	300
	HK 2	1	9.21	1.91	10	300
	HK 3	1	5.60	1.09	10	300
	HK 4	1	7.94	4.64	10	300
	HK 5	1	6.86	1.36	10	300
	HK 6	1	6.32	0.82	10	300
	HK 7	1	0.18	0.55	10	300
	HK 8	1	7.76	0.82	10	300
	HK 9	1	6.32	1.09	10	300
	HK 10	1	8.85	1.64	10	300
24.02.2005-16.03.2005	HK 1	2	1.62	1.36	10	300
	HK 2	2	4.51	0.82	10	300
	HK 3	2	3.25	0.55	10	300
	HK 4	2	7.22	0.27	10	300
	HK 5	2	5.05	2.18	10	300
	HK 6	2	3.07	0.27	10	300
	HK 7	2	7.22	0.82	10	300
	HK 8	2	6.86	2.18	10	300
	HK 9	2	3.25	2.73	10	300

Date	Location	Order	Conc.(μg/m^3) 20 Days Period		Regulation on Air Quality Protection (ST Limits) (μg/m^3)	
			HF	HCl	HF	HCl
	HK 10	2	7.94	4.36	10	300
16.03.2005-05.04.2005	HK 1	3	5.78	1.36	10	300
	HK 2	3	7.22	2.45	10	300
	HK 3	3	3.43	3.54	10	300
	HK 4	3	8.30	2.18	10	300
	HK 5	3	5.05	1.64	10	300
	HK 6	3	5.78	3.54	10	300
	HK 7	3	4.51	3.54	10	300
	HK 8	3	3.25	2.45	10	300
	HK 9	3	5.96	2.18	10	300
	HK 10	3	9.39	2.45	10	300

The analysis results for HF and HCl reflects that the measured values are lower than the ST limit values, except at the sampling point HK 1 during the first sampling period (04.02.2005-24.02.2005) the HF concentration (10.65 μg/m^3) is higher than the ST limit value of 10 μg/m^3.

Average concentrations of three periods are listed in the table below.

Table 3.2.9.26. Averages of Three Measurements

Location	Concentration (μg/m^3)		Regulation on Air Quality Protection (LT Limits) (μg/m^3)	
	HF	HCl	HF	HCl
HK 1	6.02	1.09	-	100
HK 2	6.98	1.73	-	100
HK 3	4.09	1.73	-	100
HK 4	7.82	2.36	-	100
HK 5	5.65	1.73	-	100
HK 6	5.06	1.54	-	100
HK 7	3.97	1.64	-	100
HK 8	5.96	1.82	-	100
HK 9	5.18	2.00	-	100
HK 10	8.73	2.82	-	100

HCl concentrations were in compliance with the long term limit values. There are no long term limit values for HF concentrations.

Previous Measurement Results

TEAŞ assigned TUBITAK-MAM Research Center, which is national official science center of Turkey, for the SO_2 baseline measurements on the region in 2002. The study was conducted during 01.11.2002 and 04.11.2003. The measurement was based on Ultraviolet Fluoresans Principle and AF21 M instrument working according to EPA EQSA-0292-084. The measurement results are given by Annex B8.

The results of the measurement were evaluated according to RAQP which was in use in 2003. One year measurement results show that, SO_2 concentration is in compliance with the both LT and ST Turkish air quality standards, which are 150 μg/Nm^3 and 400 μg/Nm^3 respectively.

3.2.10. Health (Endemic diseases in the region and other diseases and other health services)

Afşin District has a State Hospital that has bed capacity of 100. There are also 12 health houses. In 2002 year, the number of the pharmacies is 12 (Source: Provincial Health Directorate). In Çoğulhan Town, there is one health house.

Endemic diseases are not encountered in Kahramanmaraş Province. Occurrence and death of the diseases that can be protected by vaccine, diseases that can be spread by water and food the diseases, of which notification is obligatory in Kahramanmaraş is given by Table 3.2.10.1.

Table 3.2.10.1. Occurrence and Death of the Diseases That Can Be Protected by Vaccine, Diseases that can be Spread by Water and Food, the Diseases, of Which Notification is Obligatory

Disease	Occurrence	Death
Disease that can be protected by vaccine		
Whooping-cough	2	-
Measles	204	-
Tetanus	1	
Disease that can be spread by water and food		
Typhoid fever	400	-
P-Typhoid fever	13	-
A-Dysentery	278	-
B-Dysentery	16	-
Hepatitis-A	493	-
Hepatitis-B	27	1
Enterit	15764	4
The diseases of which notification is obligatory		
Meningitis	9	1
Brusella	106	-
Anthrax	10	-
Scarlet Fever	46	-
Strept-Angina	3067	-

Source: Çalışma Yıllığı, T.C. Sağlık Bakanlığı, 1997

In this region, epidemiologic cancer survey has been conducted by Ministry of Health Cancer Department. According to the results of the survey, cancer occurrences are not observed in Afşin-Elbistan Region, they are observed in the people living in Kahramanmaraş City Center.

The report prepared by Ministry of Health states that there is no evidence that the cancer occurrences are resulted from the power plant.

The result of the defining epidemiology survey shows that there have been 57 cancer occurrences in Elbistan during 4 years.

Table 3.2.10.2. Cancer Occurrences in Elbistan District

Year	Cancer Occurrence	Incidence
1998	5	4.07
1999	18	14.6
2000	17	13.8
2001	17	13.8

Source: Kahramanmaraş Afşin-Elbistan Thermal Power Plant Report, KSDB, Ministry of Health, Ankara, 2002

In conclusion, the cancer occurrences have not been well-recorded therefore the number of the occurrences is below the estimation. Approximately 100 cancer occurrences per year are observed at a place with 100.000 population. As it is seen by the table, the records of the occurrences are below the ratio of ¼. According to these numerical distributions, rate of the cancer increase is not high in Elbistan.

The result of the defining epidemiology survey shows that there have been 34 cancer occurrences in Afşin during 5 years.

Table 3.2.10.3. Cancer Occurrences in Afşin District

Year	Cancer Occurrence	Incidence
1996	4	-
1998	1	-
1999	5	6.9
2000	13	18.1
2001	13	18.1

Source: Kahramanmaraş Afşin-Elbistan Thermal Power Plant Report, KSDB, Ministry of Health, Ankara, 2002

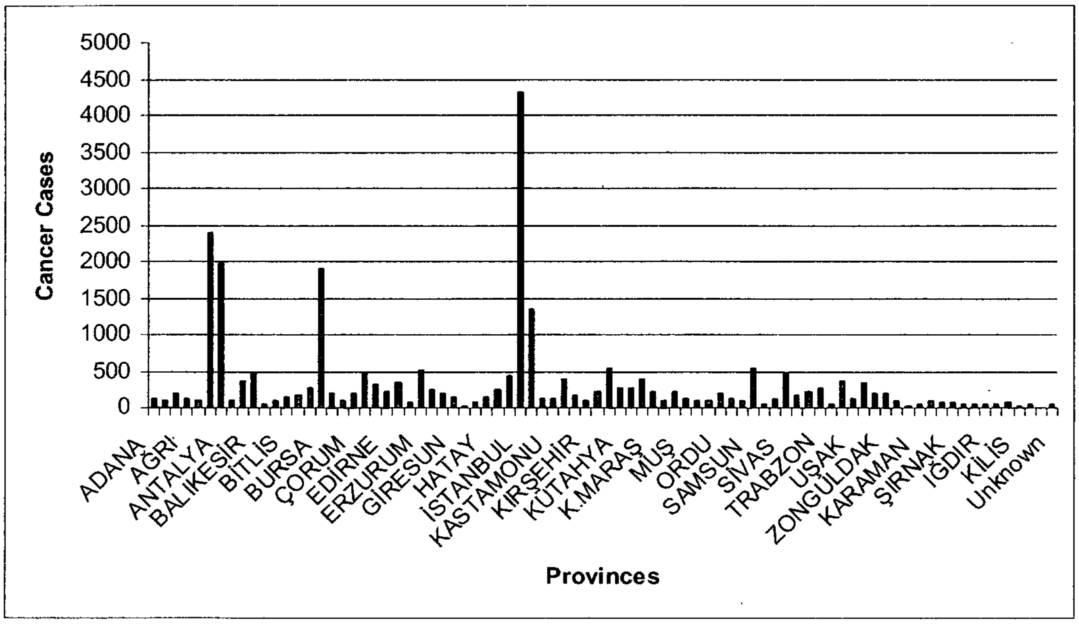


Figure 3.2.10.1. Distribution of the Cancer Cases Provinces according to the Provinces, 1999 (Source: Ministry of Health)

Respiratory Diseases in Afşin and Elbistan

The data on respiratory diseases observed in Afşin District is given by the table below (1997-2004).

Table 3.2.10.4. Statistics on Respiratory Diseases in Afşin District (1997-2004)

Year		Acute Upper Respiration Infections	Acute Sinusitis	Acute Quinsy	Acute Tonsillit	Acute Bronchitis	Acute Larenx inflammation and others	Pneumoni
		Occurrence	Occurrence	Occurrence	Occurrence	Occurrence	Occurrence	Occurrence
1997	M	2.471	338	263	735	519	26	36
	F	2.181	398	230	634	473	16	22
	T	4.652	736	493	1.369	992	42	58
1998	M	4.307	590	421	881	1.022	97	306
	F	3.817	583	320	810	913	68	217
	T	8.124	1.173	741	1.691	1.935	165	523
1999	M	4.927	848	887	1.404	1.159	283	219
	F	4.582	692	828	1.362	1.226	305	184
	T	9.509	1.540	1.715	2.766	2.285	588	403
2000	M	5.324	780	772	1.413	1.375	391	341
	F	5.170	775	771	1.485	1.967	480	373
	T	10.494	1.555	1.543	2.898	3.342	871	714
2001	M	6.128	693	491	1.536	1.260	91	165
	F	5.825	714	403	1.488	1.264	107	128
	T	11.953	1.407	894	3.024	2.524	198	293
2002	M	5.473	596	293	1.240	1.108	9	
	F	4.970	496	263	1.305	994	5	
	T	10.443	1.092	556	2.545	2.102	14	
2003	M	6.461	1.088	229	693	2.089	1	4
	F	6.389	1.148	182	733	2.108	2	8
	T	12.850	2.236	411	1.426	4.197	3	12
2004	M	12.754	1.202	297	1.396	2.807	208	161
	F	13.543	1.198	306	1.525	2.836	230	159
	T	26.297	2.400	603	2.921	5.643	438	320

Source: Provincial Directorate of Health, 2005

Table 3.2.10.5 Increase Rate of Respiratory Diseases in Afşin District (1997-2004)

	Increase (%)						
Year	Acute Upper Respiration Infections	Acute Sinusitis	Acute Quinsy	Acute Tonsillit	Acute Bronchitis	Acute Larenx inflammation and others	Pneumoni
1997-2000	125.58	111.28	212.98	111.69	236.90	1973.80	1131.03
2001-2004	120.00	70.58	-32.55	-3.41	123.57	121.21	9.22
1997-2004	465.28	226.09	22.31	113.37	468.85	942.86	451.72

Source: Provincial Directorate of Health, 2005

As it is seen from the table above, the respiratory diseases have been increasing in Afşin from 1997 to 2004.

Table 3.2.10.6. Statistics on Respiratory Diseases in Elbistan District (1997-2004)

Year		Acute Upper Respiration Infections	Acute Sinusitis	Acute Quinsy	Acute Tonsillit	Acute Bronchitis	Acute Larenx inflammation and others	Pneumoni
1997	E	2.667	174	306	298	229	2	192
	K	2.646	205	235	291	222	2	140
	T	5.313	379	541	589	451	4	332
1998	E	3.542	214	370	586	546	28	141
	K	3.590	218	322	524	435	36	123
	T	7.132	432	692	1.110	981	64	264
1999	E	2.950	520	453	741	833	105	297
	K	2.942	434	430	766	858	77	287
	T	5.892	954	883	1.507	1.691	182	584
2000	E	3.526	282	363	788	763	34	129
	K	3.506	258	284	789	681	28	125
	T	7.032	540	647	1.577	1.444	62	254
2001	E	5.315	443	444	1.407	875	101	80
	K	4.844	428	426	1.296	873	108	62
	T	10.159	871	870	2.703	1.748	209	142
2002	E	2.731	608	455	1.564	1.023	97	67
	K	2.475	623	436	1.289	983	92	60
	T	5.206	1.231	891	2.853	2.006	189	127
2003	E	2.123	682	322	1.319	841	72	50
	K	2.220	686	257	1.236	809	56	47
	T	4.343	1.368	579	2.555	1.650	128	97
2004	E	3.236	632	542	1.460	943	61	54
	K	3.230	636	490	1.308	821	68	47
	T	6.466	1.268	1.032	2.768	1.764	129	101

Source: Provincial Directorate of Health, 2005

As it is seen by the table above, the respiratory diseases also increased in Elbistan. However, the increase ratio is much lower than Afşin.

Normalized respiratory diseases data (frequency at 100,000 population) for Afşin and Elbistan Districts are given in the tables below.

Table 3.2.10.7. Frequency of Respiratory Diseases in Afşin for 100,000 Population

Year	Acute Upper Respiration Infections	Acute Sinusitis	Acute Quinsy	Acute Tonsillit	Acute Bronchitis	Acute Larenx inflammation and others	Pneumoni
1997	6.051	957	641	1781	1290	55	75
1998	10.568	1.526	964	2200	2517	215	680
1999	12.370	2.003	2231	3598	2972	765	524
2000	13.651	2.023	2007	3770	4347	1133	929
2001	15.549	1.830	1163	3934	3283	258	381
2002	13.585	1.421	723	3311	2734	18	0
2003	16.716	2.909	535	1855	5460	4	16
2004	34.208	3.122	784	3800	7341	570	416

Note: Population of Afşin District according to year 1997 census is 76874 and it is 137227 according to year 2000 census.

Table 3.2.10.8. Frequency of Respiratory Diseases in Elbistan for 100,000 Population

Year	Acute Upper Respiration Infections	Acute Sinusitis	Acute Quinsy	Acute Tonsillit	Acute Bronchitis	Acute Larenx inflammation and others	Pneumoni
1997	4472	319	455	496	380	3	279
1998	6003	364	582	934	826	54	222
1999	4959	803	743	1268	1423	153	492
2000	5918	454	545	1327	1215	52	214
2001	8550	733	732	2275	1471	176	120
2002	4382	1036	750	2401	1688	159	107
2003	3655	1151	487	2150	1389	108	82
2004	5442	1067	869	2330	1485	109	85

Note: Population of Elbistan is 118814 according to year 1997, and it is 155301 according to year 2000 census.

3.2.11. Other Characteristics

Cultural Resources

There is no cultural resource in the vicinity and impact area of AEATPP. Cultural resources of Afşin District are as follows:

-Hurman Castle: The construction date of the castle is unknown. It is 35 km far from the center of the district, located between Dokuztay Village and Tanır Mahallesi.

-Dedebaba Türbesi: It is a Türbe in the center of the District.

-Büget Cistern: It is a dam weir constructed during Roma era. It is located at Büget Village.

-Kuruhan: It is an inn located at Afşin-Dağlıca Road and it is location is 25 km far from Afşin District.

-Eshab-ı Kehf: It is composed of mosque, caravanserai and ribat. Location of the Eshab-ı Kehf is 7 km from the center of the district.

CHAPTER IV: IMPACTS OF THE PROJECT ON THE AREA DESCRIBED BY CHAPTER III AND MITIGATION MEASURES

(In this chapter, impacts of the project on physical and biological environment, legal, administrative and technical mitigation measures to prevent, mitigate and rehabilitate these impacts are discussed in detail for both Section IV.I & Section IV.2)

IV.1. Activities during Land preparation, Construction and installation, Impacts on Physical and Biological Environment and Mitigation Measures

IV.1.1. Location and Amount of Excavation Works, Where Excavation Wastes Such As Soil, Stone, Sand etc. Will Be Transported and for Which Purposes They Will Be Used, Dust Emitting Mechanical Processes such as Crushing, Grinding, Transportation and Storage, Mitigation Measures during Land Preparation and Construction of FGD Unit

The rehabilitation project (first phase) will involve removal and/or replacement of obsolete plant components. Land preparation and construction works will be involved for the project for the foundation of FGD unit. Total amount of excavated material will be about 100,000 m^3 maximum. The material excavated during land preparation will be used as filling material and the excess material will be conveyed to stripping area by the trucks.

The main sources of emissions to the atmosphere during construction will comprise dust. Emissions during the construction of a building can be associated with land clearing, drilling and blasting, ground excavation, cut and fill operations and construction of a particular facility itself. Dust emissions often vary substantially from day to day, depending on the level of activity, the specific operations, and the prevailing meteorological conditions. A large portion of the emissions can also results from equipment traffic over temporary roads at the construction site.

Dust emission produced during the land preparation and construction of FGD unit is calculated below.

Activity area : 26267 m^2
Duration : 156 days
Daily excavation: 168 m^2/day
Emission Factor : 9 g/m^2/day (Source: USEPA)

During construction, normal working hours will be 8 hours a day.

Dust emission: 9 g/m^2/day x 168 m^2 x (1day/8 hours)
: 189 g/h =0.189 kg/h

Emission from Transportation of Excavated Material:

20 ton/truck (each travel)	≈ One travel per hour.
One travel	: 0.20 km
Silt content(K)	: %5 (average) (AP 42, Fifth Edition, Volume I Chapter 13: Miscellaneous Sources)
Total weight (A)	: 30 ton (travel) – 10 ton (return)
Road surface moisture ratio(N)	: %20
Emission factor (E)	: kg/km

E (travel) = $2.819 \times (K/12)^{0.8} \times (A/3)^{0.5} / (N/0.2)^{0.4}$ (Emission Factor Documentation, EPA, 1998)
= $2.819 \times (5/12)^{0.8} \times (30/3)^{0.5} / (20/0.2)^{0.4}$
= 0.701 kg/km
Emission (travel) = 0.701 kg/km x 0.2 km/travel x 1 travel/h
= 0.14 kg/h
E (return) = $2.819 \times (K/12)^{0.8} \times (A/3)^{0.5} / (N/0.2)^{0.4}$
= $2.819 \times (5/12)^{0.8} \times (10/3)^{0.5} / (20/0.2)^{0.4}$
= 0.405 kg/km
Emission (return) = 0.405 kg/km x 0.2 km/travel x 1 travel/h
= 0.081 kg/h

Total Emission: 0.189 + 0.14+0.081 = 0.41 kg/h

Article 40 of RIAPC states that emission limit value for the sources except for the stacks are 1.5 kg/h. Regulation states that "If the calculated emission amount is above this value, contribution to air quality should be calculated". Because the total dust emission is below the 1.5 kg/h, there is no need to calculate contribution to air quality.

Regulation on Industrial Air Pollution Control (RIAPC) will be complied.

Potential impacts associated with dust emissions during the land preparation and the construction phase will be minimized by the following methods;

- Stockpiles of material will be done in such a manner so as not expose them to wind by covering them with suitable sheet material.
- The access road will be water sprinkled to prevent dust formation.
- Particular attention will be paid to dust suppression on the working width or at construction sites when working within during dry weather conditions.
- Vehicles delivering dusty construction materials to the site or removing spoil will be limited at speed and covered.

According to "Regulation on Excavation Soil, Construction and Ruins Control" published by 18.03.2004 dated and 25406 numbered Official Gazette, following items of will be complied during the excavation works carried out at site.

- People conducting the excavation works are responsible from the taking the precautions reducing the noise and visual pollution and dust emissions and covering of the surrounding of the activity area. Planning is to equalize the soil amount from the excavation and the filling amount and the priority is given to reuse of the excavation soil in the activity area.
- Natural drainage systems are protected during the excavation and precaution is taken for the possible erosion. People/establishment conducting the excavation is responsible from the protection of the buildings, natural drainages, energy/telecommunication facilities/systems, pavements and road coverages, and the precautions for the losses and the erosions.

- Vegetative soil is stored separately from the subsoil. It is piled to reused depending on the depth and structure of the soil.

During the construction works of the project, considering the meteorological factors, long term and short term limit values of Article 6 of RAQP will be complied as much as possible.

IV.1.2. Supply, Transportation and Storage and Utilization of Flammable, Explosive, Dangerous and Toxic Materials to be used During Land Preparation and Construction of FGD Units

Only working machines will be used during land preparation and construction of FGD units, therefore no flammable, dangerous, explosive or toxic material shall be used on the site.

IV.1.3. Water Supply System and Plan of the Project, Amount and Characteristics of Water that Will Be Used, Where and How the Water Will be Supplied, Amount and Characteristics of The Wastewater Resulting from These Activities, How It Will Be Treated and Where It Will Be Discharged

Water Supply during the Construction Phase

During the construction works of the project, water will be consumed for domestic use and watering for dust prevention. Water demand of the AEATPP is currently supplied from Ceyhan River Spring at Pınarbaşı Locality of Elbistan District. During the rehabilitation of AEATPP and the construction of FGD unit, required water will continue to be supplied from same source.

During the construction works of the power plant, approximately 300 people will be employed. Assuming daily water consumption 150l/capita, daily water demand will be about

300 capita x 150 l/day-capita = 45000 l/day= 45 m^3/day.

Wastewater to be produced during Construction Phase

Assuming all of the consumed water will be discharged as wastewater, domestic wastewater in amount of 45 m^3/day will be produced during construction works of the project. Wastewater to be produced at the work sites will be discharged to the present sewer system. Pollution load of the general domestic wastewater is given by Table IV.1.3.1.

Table IV.1.3.1. Total Pollution Load of Domestic Wastewater

Parameter	Unit Load (mg/l)	Total Load (kg/h)
BOD_5	220	0.4125
COD	500	0.9375
SS	220	0.4125

During the construction activities at the first and second phase of the project, the wastewater produced will be conveyed to existing domestic wastewater treatment plant of the power plant. The capacity of the treatment plant will meet the wastewater load of the personnel during construction phase as the plant was designed for operation phase of the power plant.

Domestic Wastewater Treatment Plant

Wastewater treatment plant is composed of the following units:

- Intake conduit
- Comminutor
- Aeration tank (activated sludge system)
- Settling tank
- Sludge pumping station
- Surplus sludge storage tank

Effluent from wastewater treatment plant will have the following characteristics stated at Table 21 of Water Pollution Control Regulation.

Operation statistics:

Capacity: 15 m^3/h (average)
36 m^3/h (maximum)

Treated water effluent guaranteed values:

BOD_5 < 25 mg/l

BOD_5 dissolution > 90%

Suspended Solids < 0.3 mg/l

Wastewater form the wastewater treatment plant will meet the standards of Table 21.1 of Regulation on Water Pollution Control (RWPC) came into force by 31.12.2004 dated and 25687 numbered Official Gazette and Annex 5 and Annex 6 of "Water Products Law" it will be discharged to Çoğulhan River. Discharge standards are given below:

Table IV.1.3.2. Domestic Wastewater Discharge Standards (RWPC Discharge Standards for Domestic Wastewaters Table 21.1)

PARAMETER	UNIT	COMPOZITE SAMPLE 2 Hour	COMPOZITE SAMPLE 24 Hour
Biochemical Oxygen Demand (BOD_5)	(mg/L)	50	45
Chemical Oxygen Demand (COD)	(mg/L)	180	120
Suspended Solids (SS)	(mg/L)	70	45
pH	-	6-9	6-9

Source: RWPC Table 21.1 Sector: Domestic Wastewater (Class 1: Pollution Load is between 5-60 kg/day as raw BOD)

IV.1.4. Types and Amounts of Solid Wastes which will be Produced as a Result of Activities Starting from the Land Rehabilitation till Operation of FGD Unit and Completion of Rehabilitation Works about Other Units, Where They will be Transported and for Which Purpose They will be Used

Solid wastes generated during the construction works of both first and second phases of the project will include domestic solid wastes from the personnel, medical wastes, hazardous wastes from the construction such as used batteries, bitumen, cables, copper, fire-fighting foam, adhesives, general chemicals, acids, oil rags and absorbents, solvents, contaminated soils, insulation, paint sludge, used oil and paint cans and drums etc. and package wastes.

Approximately 300 people will be employed in the construction of the project. Qualified ones such as foremen, vehicle operators, etc. will be provided by subcontractor, and unqualified ones will be provided from the region. Assuming that 0.7 kg/capita solid waste will be produced per day, total amount of solid wastes produced will be about 210 kg/day.

According to "Regulation on Solid Waste Control" published on 14.03.1991 dated and 20814 numbered Official Gazette, all operations related with storage, transportation and disposal of solid wastes will be carried out in accordance with the following issues:

- Domestic wastes will be collected at black bags separated from medical, hazardous dangerous and package wastes.
- Separately collected domestic wastes will be transported to temporary waste storage center or container by special vehicles for this and they will be stored separately.
- Domestic wastes will not be mixed with any hazardous waste and/or medical waste during the collection.
- Paper, cardboards, plastics and metal package wastes produced during the rehabilitation will be segregated according to their type and collected by blue bags separate from other wastes.
- Waste collection containers will be supplied at site. Reusable wastes such as paper, plastics and non-reusable wastes such as food wastes will be collected at separate containers.

In the current situation, solid wastes of AEATPP is taken by private firm and disposed. Solid wastes produced during the rehabilitation and construction of FGD during the second phase will also be disposed by the same way.

According to Regulation on Packaging and Packaging Wastes issued on 30.07.2004 dated and 25538 numbered Official Gazette, collection, transportation, storage and disposal of package wastes will be conducted separately from the other wastes.

According to Regulation on Hazardous Waste Control came into force by 14.03.2005 dated and 25755 numbered Official Gazette, any hazardous waste such as heavy metal containing wastes, chemical wastes formed during the construction will be stored at separate containers until taken by licensed vehicles that will transport them to the licensed incineration center.

According to Regulation on Waste Batteries and Accumulators Control came into force by 31.08.2004 dated and 25569 numbered Official Gazette, batteries and accumulators will be stored separately from the domestic wastes and taken by the recycle companies.

According to Regulation on Medical Wastes Control came into force by 22.07.2005 dated 25883 numbered Official Gazette, the medical wastes produced at the medical center of the power plant will be collected at red bags and containers and they will be disposed.

According to Regulation on Waste Oil Control came into force by 21.01.2004 dated and 25353 numbered Official Gazette, waste oils formed during the project phases will be collected separately, transported by the licensed vehicles to the licensed disposal centers.

IV.1.5. Sources and Levels of Vibration and Noise Produced as a Result of Activities Starting from the Land Preparation to Commissioning of the Units

During the construction works, potential for noise is expected from trucks, dozer, mixer, excavator, compressor, and grader. These equipments are considered to produce noise of similar type and level to noise sources often experienced in rural environments. The potential for noise will be minimized by restricting construction works to those hours permitted by the relevant working hours.

All equipment to be used on site shall be fitted with standard noise suppression and will meet Regulation on Assessment and Management of Environmental Noise.

An assessment of noise levels likely to be experienced during the main phases of works has been carried out for the soil excavation works, the foundation and ground improvement works, construction of the buildings. Assessment has been made using the following assumptions:

Conservative proportions of time that plant will be operating (i.e. all of the equipments will not operate at the same time so noise levels will actually be lower than we have calculated);

No mitigation measures to prevent transmission of noise included on site (this can be arranged if required);

Machines and equipment working during land preparation and construction are tabulated below:

Table IV.1.5.1. Noise Levels of the Machines Used for Construction

Machine	Noise Level (dBA)
Truck	85
Excavator	105
Compressor	115
Bulldozer	120
Crane	105
Generator	95
Mixer	115

Source: Turkish Environmental Legislation 1999

Equivalent noise levels from working machines are calculated by the following formula:

$L_{eq} = L_w + 10 \log (Q/4\pi r^2)$
L_{eq} = Sound pressure level, dBA
L_w = sound power of the source, dBA
r = distance, m
Q = Coefficient depending on roughness of area

Average equivalent noise level at site decreases by the effect of the atmosphere Decrease in sound by the effect of the atmosphere (A_{atm}) varies with the frequency of source and distance from the source. Frequency range is accepted as 3500 Hertz.

$A_{atm} = 7.4 * 10^{-8} (f^2 \times r / \phi)$
A_{atm} = Decrease in sound by the effect of atmosphere, dBA
f = Frequency of the source, Hertz
ϕ = Relative moisture, %
r = distance, m

Equivalent noise distribution according to distances during construction is given in Table IV.1.5.2 and Figure IV.1.5.1.

Table IV.1.5.2. Equivalent Noise Distribution According to Distances during Construction Works

r (m)	Truck (dBA)	Dozer (dBA)	Excavator (dBA)	Mixer (dBA)	Compressor (dBA)	Grader (dBA)	Crane (dBA)	Generator (dBA)	L_{eq} (dBA)	A_{atm} (dBA)	L (dBA)
10	62.02	92.02	77.02	87.02	87.02	92.02	77.02	67.02	96.33	0.185	96.15
20	56.00	86.00	71.00	81.00	81.00	86.00	71.00	61.00	90.31	0.370	89.94
30	52.48	82.48	67.48	77.48	77.48	82.48	67.48	57.48	86.79	0.555	86.24
40	49.98	79.98	64.98	74.98	74.98	79.98	64.98	54.98	84.29	0.740	83.55
50	48.04	78.04	63.04	73.04	73.04	78.04	63.04	53.04	82.35	0.925	81.43
60	46.46	76.46	61.46	71.46	71.46	76.46	61.46	51.46	80.77	1.110	79.66
70	45.12	75.12	60.12	70.12	70.12	75.12	60.12	50.12	79.43	1.295	78.14
80	43.96	73.96	58.96	68.96	68.96	73.96	58.96	48.96	78.27	1.480	76.79
90	42.94	72.94	57.94	67.94	67.94	72.94	57.94	47.94	77.25	1.665	75.58
100	42.02	72.02	57.02	67.02	67.02	72.02	57.02	47.02	76.33	1.850	74.48
150	38.50	68.50	53.50	63.50	63.50	68.50	53.50	43.50	72.81	2.775	70.04
200	36.00	66.00	51.00	61.00	61.00	66.00	51.00	41.00	70.31	3.700	66.61
250	34.06	64.06	49.06	59.06	59.06	64.06	49.06	39.06	68.38	4.625	63.75
300	32.48	62.48	47.48	57.48	57.48	62.48	47.48	37.48	66.79	5.550	61.24
400	29.98	59.98	44.98	54.98	54.98	59.98	44.98	34.98	64.29	7.400	56.89
500	28.04	58.04	43.04	53.04	53.04	58.04	43.04	33.04	62.35	9.250	53.10
600	26.46	56.46	41.46	51.46	51.46	56.46	41.46	31.46	60.77	11.100	49.67
700	25.12	55.12	40.12	50.12	50.12	55.12	40.12	30.12	59.43	12.950	46.48
1000	22.02	52.02	37.02	47.02	47.02	52.02	37.02	27.02	56.33	18.500	37.83
2000	16.00	46.00	31.00	41.00	41.00	46.00	31.00	21.00	50.31	37.000	13.31
2500	14.06	44.06	29.06	39.06	39.06	44.06	29.06	19.06	48.38	46.25	2.13

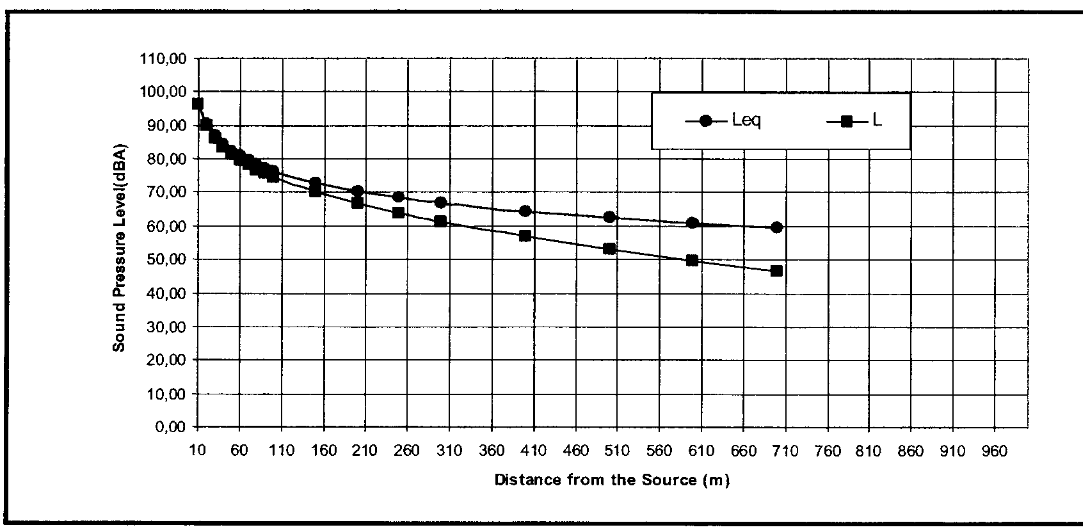


Figure IV.1.5.1. Equivalent Noise Distribution According to Distances during Construction Works

As it is seen on the table and graph above, noise level is below 70 dBA at 150 m distance from the construction site. The noise level in Çoğulhan that is 600 m far from the AEATPP location is 45 dBA in the worst case; therefore noise level will not have big impacts on dwellings.

The result is that our assessment is a conservative estimation of noise, and actual noise should normally be much lower than calculated.

In order to protect workers from the noise, following issues will be considered.

During activity,

-to protect health of workers

-to keep continuation of activity, Regulation on Assessment and Management of Environmental Noise will be complied.

Contractor will provide personnel protection equipment such as ear guards.

Limits from the Regulation on Assessment and Management of Environmental Noise for noise levels to be achieved at receptors during construction are presented in the following table. Limit value for the building constructions for daytime is 70 dBA.

Table IV.1.5.3.Environmental Noise Limit Values for Construction Sites

Activity (Construction, destruction and repair)	L_{day} (dBA)
Building	70
Road	75
Other sources	70

Source: Regulation on Assessment and Management of Environmental Noise

IV.1.6. Types and Consumption Amounts, and Emission Amounts of the Fuels to Be Used for the Works from Land Preparation till Operation of FGD Unit

The construction process will not involve any equipment or plant that produces significant exhaust emissions. The equipment to be used on site will be normal heavy construction equipment plant such as excavator, bulldozer, mixer, compressor, mobile crane and welding machine.

Heavy construction equipments will use diesel as fuel. Characteristics of the diesel fuel is given by the table below:

Table IV.1.6.1. Characteristics of Diesel

Property	Test Unit	Guarantee	Limit	Test Method ASTM	IP
Density at 15 ^0C	kg/lt	0.820-0.860		D 1298	
Flash Point	^0C	55	Min	D 93	
Cold Filter Plugging Point (CFPP)	^0C				309
Winter Grade (a)		- 10	Max		
Summer Grade (b)		5	Max		
Distillation	vol %			D 86	
Recovered at 250 ^0C	vol %	65	Max		
Recovered at 350 ^0C	vol %	85	Min		
Recovered at 370 ^0C	vol %	95	Min		
Sulfur	wt %	0.70	Max		336 or 242
Carbon Residue (on 10 % residue)	wt%	0.30	Max	D 524 or D 4530	
Viscosity at 40 ^0C	Cst	2.0-4.5		D 88 or D 445	
Copper Strip Corrosion (3h at 50 ^0C)		No.1	Max	D 130	
Ash	wt%	0.01	Max	D 482	
Cetane Index	Calculated	46	Min	D 976	
Water	mg/kg	200	Max	D 6304	
Particulate matter	mg/kg	24	Max		415
Oxidation Stability	g/m^3	25	Max	D 2274	

Source: www.tupras.com.tr

Amount of the emissions from the vehicles depends on the kind of the vehicle and the fuel, speed of the vehicle, its maintenance and the type of the activity. United States Environmental Protection Agency (USEPA) determined the emission factors considering these issues. Emission factors are given by the table below:

Table IV.1.6.2. Emission Factors (Mobile Sources Emission Factors, EPA, 1995)

Vehicle	HC (g/km)	CO (g/km)	NO_x (g/km)
Light Working Machine (Gasoline)	0.115	1.342	0.111
Light Working Machine (Diesel)	0.181	0.719	0.544
Heavy Working Machine (Gasoline)	0.506	6.894	1.763
Heavy Working Machine (Diesel)	1.313	5.950	4.056

Mass flow rates of the emissions from the construction equipment and the limit values determined by Article 40 of Regulation on Industrial Air Pollution Control for the calculation of contribution of the plants to air pollution are given below:

Table IV.1.6.3. Mass Flow Rates of the Emissions from the Construction Equipment

Parameter	Flow Rate (g/h)	Mass flow rate (kg/day)	Emission Limits of RIAPC (kg/h)
HC (Hydrocarbons)	85	0.7	-
CO (Carbon monoxide)	596	4.8	50
NO_x (Nitrogen oxides)	259	2.1	4

Assumptions:
1) 2 construction machines from each class are used at the same time
2) Speeds up to maximum 40 km/h
3) 8 working hours
4) Regular maintenance of the equipment

As it is seen by the Table IV.1.6.3, total amount of the emissions from working machines will comply with the limits given by Article 40 of RIAPC dated 07.10.2004. Therefore, there is no need to calculate their contribution to air pollution and they have no important impact on air quality.

Following issued will be implemented for the control of exhaust emissions:

- Vehicles and equipment will be maintained at regular pre-determined timing so as to control combustion emissions from engines and other temporary equipment.
- Engines will not be left running unnecessarily.

Necessary measures on this subject are stated at EMP given by Annex A1.

IV.1.7. Where and How the Accommodation and Other Technical/Social Infrastructure Needs Of the Personnel Who Will Work During Starting From Land Preparation till Operation of FGD

Personnel will be recruited mostly from the local workforce as much as possible. Accommodation and other technical/social infrastructure needs of the personnel working for the construction works will be supplied from existing guesthouse, houses at AEATPP and or the houses in Afşin.

IV.1.8. Activities Posing Risks and Dangers to Human Health and Environment That will Be Carried Out During the Works from Land Preparation till Operation of FGD Unit

During the construction works, the risks posed to human health are possible industrial accidents resulting from the construction works requiring use of heavy construction equipment. These accidents are generally caused by carelessness and ignorance of safety instructions.

In order to minimize these risks,

- Qualified personnel will be employed for the construction equipments and all personnel will be trained for health and safety issues,
- Working hours will be limited,
- Personnel protection equipment will be supplied and all workers will wear them,
- Personnel will be monitored to assure they use protection equipment,
- Health centre and health staff will be ready for the incidents on site,
- The measures will be taken for fire fighting.

Work Health and Safety Regulation came into force by 09.12.2003 date and 25311 numbered Official Gazette and Worker Health and Worker safety Rule will be complied. 2918 numbered Highways Traffic Law will be complied during construction phase of the project. The issues stated at EMP given by Annex-1 will be complied.

IV.I.9. Other Activities

There is no other activity to be discussed in this chapter.

IV.2. Activities in the Operation Phase of the project, Impacts on the physical And Biological Environment and the Mitigation Measures

IV.2.1. Characteristics and Capacities of All Units Within the Scope of the Project, Process Flow Chart, Basic Process Parameters, Description of Process, Other Services Beside Activity Units

Description of Existing Condition of AEATPP

AEATPP is a conventional thermal power plant utilizing low quality lignite from Kışlaköy Region. Lignite is sent to stock pile, which have capacity of 1 million, with bands. The power plant consumes 3000-ton fuel per hour at full load with 4 units.

Lignite reserves of Afşin-Elbistan are the biggest reserves of Turkey. Total amount of the reserve is 3.4 billion ton and 1.7 billion ton of the total amount is economical reserve. As the reserves are concentrated in the region, it is possible to construct big power plants, although its ash and moisture ratio is high and calorific value is low.

Steam temperature and pressure in the boiler superheater outlet are 535 °C and 197.5 kg/cm^2 respectively and each boiler produces 1020 ton/h steam. Voltage is 21 kV at the outlet of generator that is then amplified to 380 kV in order to connect energy to interconnected system.

Process water of the plant is supplied from the Ceyhan River Spring. Water need of the power plant is 5400 ton/h.

Ash going to the stack is kept by the electrostatic precipitators. Stacks are 145 meter high.

There is a spare pond with 40.000 tons of water capacity if any failure occurs in the cooling water system and there are two fuel tanks for the diesel and fuel oil used for startup. Each tank has 10000-ton capacity.

The plant was designed to burn the low quality lignite with high moisture easily without using supplementary fuel. The system developed for such lignite is indirect firing system.

Coal is taken from bunker to mills and heated with the hot gas from the boiler outlet in order to evaporate the moisture in it. This mixture of gas, steam and dust coal is passed from the mechanical separator and some part is sent to the boiler, the other part is sent to electrostatic precipitator (bruden filters). Electrostatic precipitator filters dry coal dust and the vapor is discharged from the bruden stacks that are 120 meter in height. Dry coal dust is given to the boiler as fuel that has high calorific value. This fuel is 1/3 of total amount and it is enough to maintain combustion.

Production data of AEATPP:

Maximum production capacity	: 11 517 500 MWH
Project production capacity	: 8 807 500 MWH
Average production of last 5 years	: 5 647 248 000 kWH
Calorific value of lignite	: 950-1600 kCal
Gross production (year 2004)	:1 825 440 000 kWh
Net production (year 2004)	:1 589 697 939 kWh
Main fuel (year 2004)	: 4 700 978 ton
Consumed auxiliary fuel (year 2004)	: 5698 ton fuel oil, 4102 ton diesel
Specific heat consumption (year 2004)	: 3151 kCal/kWh
Specific main fuel consumption (year 2004)	: 2619 g/kWh
Thermal Efficiency (year 2004)	: 27.29 %
Auxiliary fuel consumption (year 2004)	: 5.37 g/kWh
Internal consumption percentage (year 2004)	: 12.91 &
Capacity Factor (year 2004)	: 15.34%
Availability Factor (year 2004)	: 53.78%

Source: EÜAŞ, 2005

Table IV.2.1.1. Production Data of AEATPP according to Years

Installed capacity(MW)	3x340+1x355
Maximum Production Capacity (MWH)	11.517.500
Project Production Capacity (MWH)	8.807.500
Average production of last year (kWH)	5.647.248.000
Fuel type	lignite
Fuel calorific value	900-1100

Source: EÜAŞ

TECHNICAL CHARACTERISTICS OF EXISTING PLANT

General layout of AEATPP is given by Annex 1 and technical characteristics of the plant are given below:

Electrostatic Precipitators
Number : 6 per unit

The data on flue gas precipitators are given by the table below.

Table IV.2.1.2. Flue Gas Precipitator Efficiency Data

	Units	Design	Test 1	Test 2
Inlet Temperature	deg C	180	212	-
Inlet Dust Burden	g/Nm^3	42.3	10	9
Outlet Dust Burden	mg/Nm^3	423	300	400
Dust Collection Efficiency	%	99	97	96
Oxygen (inlet)	%	-	8	-
Oxygen (outlet)	%	-	9	-
Carbon in Ash	%	1.5	0.4	-

The data on vapor precipitators are given by the table below.

Table IV.2.1.3. Vapor Precipitator Efficiency Data

	Units	Design	Test 1	Test 2
Inlet Temperature	deg C	130	117	-
Inlet Dust Burden	g/Nm^3	117.1	233	168
Outlet Dust Burden	mg/Nm^3	270	1000	1000
Dust Collection Efficiency	%	99.77	99.57	99.40
Oxygen (inlet)	%	-	10.7	-
Oxygen (outlet)	%	-	12.1	-

Ash Precipitators

Number : 2 per unit

Stack

Type : Reinforced concrete, covered with stone brick

Height : 145 m

Boiler Characteristics

The boilers are once through (Benson) tower arrangement, with four-stage superheater, two-stage reheater and an economizer on top of the furnace, and firing local lignite. They produce 1020 tons/h steam flow at Maximum Continuous Rate (MCR) at 198.5 kg/cm^2 and 535°C. Design boiler efficiency is 83.3% using lignite of 1050 kcal/kg.

Boiler Type : Once through (Benson) tower arrangement
Main steam temperature : 535 °C
Main steam exit pressure : 194 kg/cm^2
Reheated steam temperature : 535 °C
Nominal Flow : 1020 ton/h
Feed Water Eco Inlet Temperature : 255 °C
Number of main burner : 12 (for Unit 1)
Number of auxiliary fuel burner : 6 (for Unit 1)
Number of Bruden burners :12

Table IV.2.1.4. AEATPP Boiler Feed Water Pumps

	Boiler Feed Water Pumps	
	Turbo-Pump	Electro-Pump
Number	1	2
Capacity	1164 m^3/h	583 m^3/h
Pump Head	3013 mSS	3013 mSS
Capacity	10346	6157 kW

Source: AEATPP Introduction Brochure, TEK

Turbine

Turbine: with condenser, one intermediate heater, high, middle and low pressure stages, 7 intermediate steam exits, 4 low pressure and there are 2 high pressure heaters at each unit.

Speed : 3000 rpm
Superheated steam inlet temperature : 530 °C
Superheated steam inlet pressure : 172.3 kg/cm^2
Reheated steam inlet temperature : 535 °C
Condenser vacuum pressure : 0,07 ata
Amount of condenser cooling water : 24400 tons/h
Condenser main cooling water temperature : 22-35.7 °C

Generator:

Generator type	: WTA F12-094 m
Capacity	: 4x382.533 MVA
Voltage	:21 KV
Frequency	:50 Hz
Warning voltage and current	:21/0.457
Cooling system and type	Stator coils with water Stator and rotor coils with hydrogen
Main transformer transformation ratio	21/340

Process Description of AEATPP

This plant is fired with lignite. In the plant, the lignite is ground into fine particles and injected with air through a number of burners into the lower part of a combustion chamber. The lignite is coming from the great Elbistan open coal mine area. Before the lignite is entering the boiler the lignite will be crushed by a coal crusher. After the coal crusher the coal is transported to the mills. Each boiler has six mills. Full load can be achieved with 5 out of 6 mills in service.

Hot flue gas from the boiler is recirculated to the mills to dry the coal. From the mills the coal is fed to the burners. Each boiler has 12 main and 12 bruden burners so that the heat is equally spreaded across the boiler. The flue gas and vapor leaving the coal mills is led to a vapor electrostatic precipitator (bruden filter) removing the coal particles and then discharged to the atmosphere via three vapor (Bruden) stacks on top of the boiler. The coal dust removed by the Bruden ESP is fed to the burners. After retrofit with an FGD the vapor gas should be led to the FGD too. Bruden (vapor) filters are used to separate vapor and coal dust. The moisture content in the coal is evaporated by flue gas heating process in the mills.

In the boiler, feed water is passed through the tube bundles in the economizer, evaporator and superheater sections of the boiler. As the feed water is passed through the tubes, it absorbs the heat energy from the exhaust gases and is converted into steam. The exhaust gases from the boiler are exhausted to the atmosphere via a stack after passing through the main ESP. Each stack is 145 meters high.

At this moment the flue gases from the boilers are passing two main ESP's to remove the fly ash. Afterwards the ESP's a part of the flue gases are recirculated back to the coal mills to regulate the temperature in the coal mill. The gas and vapor from the coal mills are passing through smaller ESP's (Bruden filters) where the coal should be removed. The coal is sent back the boiler to be burned. After passing the Bruden filters the gas is transported to the Bruden stacks (3 stacks per unit, 120 m high). The Bruden ESP's are not working well so a lot of coal is emitted into the air (black colored vapor).

SCOPE OF REHABILITATION (FIRST PHASE OF THE PROJECT)

Scope of the rehabilitation comprises the following items.

I. The Problems in the Boiler and Boiler Auxiliaries and the Necessary Maintenance, Modernization and Rehabilitations

The tube leaks were dense mainly in boiler hopper and the reheater 1. The operation management stated that there have been tube leaks in the boiler hopper zone due to erosion effect of ash and slag.

The slagging problems in the boiler of the power plant units still continue. Even the blockage of gas duct and extreme fouling in the superheater 2 depending on the CaO content were prevented with the modifications in the superheater 2 tubes, the fouling in the superheater bundles still continue due to the very high temperatures at high loads. Before eliminating the slagging problem, it is recommended that the boiler optimization should be carried out. Mills, vapor filters and coal burner air adjustments should be done and then investigation and rehabilitation which will solve the boiler slagging problem should be done.

The water sootblowers making soot blowing up to 44 m of elevation in the boilers of all units are not working. Making this equipment functional will help reducing the fouling on the heating surfaces in the combustion chamber.

There are initial operation problems in all fuel-oil burners. This situation causes time and fuel waste during start up.

It is necessary to perform rehabilitation on the pump and regulating valve system for the overflow water at the burn out grate slag water tank.

The performances of the vapor electro-filters are low in all units. Therefore units cause heavy dust pollution. Some precautions should be taken to reduce heavy pollution to the minimum level. These precautions:

It is not possible to keep the vapor gas temperature between 105-120 °C with the existing installation. This value is very important parameter affecting the electro-filter temperature, affects the electro-filter performance in a negative way and coal dust and ash stick to the bunkers and causes corrosion. To remove these negative effects and to have a temporary improvement, spray water regulating valve and temperature control system should immediately be supplied.

In addition, the performance of vapor electro-filters should be improved with maintenance.

There is inconsistent coal flow due to the sealing problems on the coal dust extractors at the exit of the coal bunkers of the vapor filters. This situation that causes inconsistent and undesirable amount of coal flow to the boiler, increases furnace temperature and shifts the flame ball to the exit of the combustion chamber. This leads to the higher temperatures at the heating surfaces with convection and causes to slagging.

To resolve the problem, the similar coal extractor used in Afşin Elbistan B Power Plant can be supplied and tested in one unit, and if positive results are obtained, the necessary modifications can be carried out in all units.

The extractor which mixes the water and the ash to be transferred from the ash bunker to ash conveyor belts are failed very often and the proper moistening with ash watering devices cannot be achieved. With improper moistening, there are problems in ash transport. Rehabilitation is necessary.

It is a well known fact that the conveyor belts NU33 and NU 34, transport the ash from the ash bunker to the ash conveyor belts at the Coal Operation Site, are 850 m in elongation, but 750 m of them are underground and operate with very difficult and negative conditions. The belts with steel cord are utilized utmost one year and renewing the belts every six months is accepted as normal. Due to high CaO content in the ash and inappropriate air-conditioning, the water vapor (humidity) and temperature inside the gallery eliminate the operating and maintenance conditions and belt conveyor Works without any control. These belts should be taken to the surface.

The ash is transported from the Power Plant to the Coal Mine with only one conveyor belt line. For operation safety one spare should be built.

II. The Problems in the Turbine and Turbine Auxiliaries and the Necessary Maintenance, Modernization and Rehabilitations

Two High Pressure (HP) Heaters of all the units are de-assembled condition. The units are operating without HP feed water heaters. HP heaters that have been problematic starting from the first construction, had been ordered to the firm named ALFA Machinery after a domestic tendering in 1998. But, due to improper supply of the heaters by the firm, the issue has been transferred to the legal platform. Because the heaters are not in operation, it causes considerable economic losses (limits the load and drops the efficiency). One HP heater for each unit should be ordered.

While ordering HP heaters, appropriateness to the original design, rehabilitation or replacement of the automatic by-pass system heater and condensate drainage and discharge systems (e.g., pump and control valve, etc.) should be considered.

Unit Master Control System has not been taken into operation, due to inappropriate connections/interface between the boiler control system and the control system of this turbine. Unit main control system should be taken into operation by providing interface between the boiler and turbine control systems. This system should be modernized at least at unit 4 and equipped for transfer of the data between the boiler and turbine (i.e., necessary also for participation to the frequency control).

The boiler-turbine control systems are Siemens Teleperm C in units 1, 2 and 3. Siemens is not, any more, manufacturing their spares. The control system should be switched to the digital system, in order to endanger units operation due to lack of the spare and to get achieve better participation to the primary frequency control.

The filler materials, nozzles and atomizing materials in the cooling towers should be renewed. The periodical cleaning and, if required, acid cleaning of the condenser pipes should be carried out.

Especially, the problems that cause to condensate temperature to become high at unit 4 should eliminated. The problem is arising from excessive loading of the condenser due to discharge of the condensate of LP heaters to condenser instead of condensate line used in normal operation mode and lack of HP heaters. All the heaters should be brought back to their normal operation modes. Bad condensate vacuum causes to decrease in efficiency.

The equipments used for on-line observation of the chemical parameters on the water and steam cycle should be subjected to rehabilitation. Most of the equipments are not functioning. For safe operation of the boiler and turbine these equipments should be functional.

The condensate pumps of LP feed heaters have not been working properly since commissioning. In order to prevent excessive loading of the condenser, the pumps and related control system should be rehabilitated or renewed.

III. Other Installations

The device for automatic coal sampling has not been functional. The equipments which are necessary for proper calorific value determination of fired and fed coals, should be supplied. The online sampling device should be installed.

The damage in the neutralization pit in the water treatment plant should be investigated and this pit should be taken outside the water treatment plant. The coatings of the drainage channels inside the water treatment plant should be done urgently.

The invertors at units 1, 2 and 3 should be improved and renewed as done at unit 4 and they should be taken into operation.

The excitation system at least one of the four units should be changed so that redundancy should be provided to the other units. Due to different design turbo-generator set, it would be suitable to change the excitation system at unit 4.

The mechanic circuit breakers of the units' 6 kV internal consumption system should be changed with vacuum type circuit breakers.

The drier should be purchased for the compressors which supply air to the circuit breakers of the switchyard. There is no drier for the outlet air of the existing compressors. Because of the frozen moisture in the air during winter circuit breaker control might be endangered. The issue is important and related with safety. Air drier should be installed urgently.

As the unit and the transfer circuit breakers are air type, circuit breakers are affected from low temperature of the medium in the winter and due to increase in contact resistance they cause explosions. Therefore, the 380 kV circuit breakers (6 pieces) should be replaced with gas type (SF_6) circuit breakers.

The cathodic protection of the raw water line from Elbistan has been damaged. Due to this pipe bursts are occurring frequently. For operation safety, cathodic protection of the line should be improved.

The coal crusher near the stone belt is not working properly and big pieces of coal are dumped to the outside, hence coal is transferred to the coal handling system again with working machines and trucks. With a functional crusher to be installed near the stone belt, the big pieces of the coal can be crushed and transferred to the conveyor belt carrying coal to the boiler, hence additional expenditures can be prevented.

24 V and 220 V system rectifiers are damaged very often and constant voltage cannot be obtained. This leads to overloading and fail in short time of DC System. The 24 V and 220 V system rectifiers of both units should be renewed.

There are problems in the turbine drainage valves of both units. Drainage valves should be changed in accordance with their design.

The air conditioning system of control rooms and relay rooms should be subject to rehabilitation.

FLUE GAS DESULFURIZATION SYSTEM INSTALLATION PHASE (SECOND PHASE OF THE PROJECT)

In the second phase, Flue Gas Desulfurization (FGD) Unit will be established in order to decrease flue gas SO_2 concentration below the Industrial Air Pollution Control Regulation that is 1000 mg/Nm^3. FGD unit will provide 95% treatment and wet limestone process technology will be preferred for FGD system. Although 83% treatment provides enough efficiency for 1000 mg/Nm^3 flue gas concentration of SO_2, FGD system providing 95% treatment will be supplied to meet the further limit values in the future.

At present, wet lime/limestone process is applied at 86% of the large power plants (>100 MW) in the world. In this system, limestone ($CaCO_3$) slurry is used for the absorption of SO_2 in the flue gas in scrubber. Limestone slurry is pumped to the scrubber from limestone solution preparation unit. In the scrubber, SO_2 containing flue gas is cleaned by spraying limestone solution at different levels to pollutant gas rising from bottom to upwards. Gypsum solution formed by the binding of SO_2 and this composition is de-watered by hydrocyclones with a ratio of 50%. Gypsum will be disposed by mixing with ash and then conveying to the ash deposit area. Detailed information on gypsum disposal is given by the Section IV.2.6.

The location of the planned FGDs will probably be the empty place between cooling tower and the stacks as shown in the Figure IV.2.1.3.

Besides water usage of about 1000 m^3/h, there will also be an electric consumption of about 40 MW and a limestone consumption of about 170 ton/h for all 4 FGD units in the plant. The limestone used will be extracted from mines within the area of Mırmırın Hill.

Main Features of FGD System

Main features of the FGD system are,

FGD Process	: Wet limestone
Features	: Limestone slurry sprayed Wet Limestone in absorber tower. Aeration and de-watering+ Flowpac
Reagent	: Ca CO_3
By-product	: $CaSO_4 \cdot 2\ H_2O$

One FGD unit will be constructed for each unit of AEATPP. Each FGD unit will comprise the absorber tower with internals (spray levels, mist eliminator, oxidation air pipers etc), the gypsum dewatering station with ash mixing devices, the oxidation air compressor, the process water station. In total 2 emergency storage tanks will be installed.

Liquid flow (recirculation) will be about 56000 t/h at maximum gas flow.

The limestone storage, ball mills and limestone slurry preparation will be same for 4 units. Three wet ball mills to grind the limestone will be installed, thereof one as spare. Each ball mill is connected with an own limestone slurry tank and a circular pipeline. The spare one can deliver limestone slurry to both tanks.

The limestone slurry will be pumped all the time in ring pipe to avoid settling of the limestone and extensive use of water for flushing purpose.

To increase availability, the tanks are connected by pipes. Each tank is able to feed the limestone slurry to each circular line.

To decrease the number of installed equipment, the unloading system is different to the one used in AEBTPP. The trucks deliver the limestone from the quarry to unloading hopper which feeds the limestone directly to a precrusher. The precrusher is designed for a particle size suitable for the ball mills. The limestone is filled to silos with bucket elevators.

Ash Handling System

The fly ash from the ESP will be transported pneumatically to the new ash silos, the slag ash will be transported by the rehabilitated belt conveyors. The existing ash bunker system will be modified for interim storage of slag ash. The ash silos to be installed will be of a capacity of approximately 3 days full operation. The fly ash will be mixed with the gypsum slurry and transported by conveyor belt to existing ash conveyor.

The existing conveyor belt has to be split up into two parts, the underground part and the part above ground level.

Gypsum-Ash Mixing System

6 pug mills will be installed. 4 of them will be in operation and 2 of them will be spare. Each pug mill has a designed capacity of 25%. Design capacity is 400 ton/h.

Process Water System

Total demand of process water is determined by the evaporation in the absorber tower and the amount of water leaving the system via the gypsum-ash mixing system. Total amount is determined as 600 t/h.

Two new process water pumps will be installed close to the storage pond with a capacity of 800 t/h. The process water tank will have capacity of 1 day operation demand, 15000 m^3.

Description of Wet Flue Gas Desulfurization (FGD)

In most developed countries, wet scrubber (flue-gas desulfurization; FGD) technology is a well-established process for removing SO_2. A simplified process flow diagram of a conventional wet scrubber is shown in the figure below. In wet scrubbers, the flue gas enters a large vessel (spray tower or absorber), where it is sprayed with water slurry (approximately 10 percent lime or limestone). The calcium in the slurry reacts with the SO_2 to form calcium sulfite or calcium sulfate. A portion of the slurry from the reaction tank is pumped into the thickener, where the solids settle before going to a filter for final dewatering to about 50 percent solids. The calcium sulfite waste product is usually mixed with fly ash (approximately 1:1) and fixative lime (approximately 5%) and disposed of in landfills. Alternatively, gypsum can be produced from FGD waste, which is a useful by-product.

"Mist eliminators" installed at the spray tower outlet or downstream ductwork collects slurry droplets and removes moisture from the flue gas. In some installations, the flue gas is reheated to avoid corrosion downstream in the power plant. Many scrubbers have gas-bypassing capability, which can be used for gas reheating. Also, gas-to-gas reheating may be used, which does not have a penalty on plant efficiency.

The figure shows conventional limestone/lime flue-gas desulfurization. After leaving the particulate removal device- ESP or a fabric filter -the gas enters a spray tower or absorber, where it is sprayed with calcium-based water slurry. The calcium in the slurry and the SO_2 in the flue gas form calcium sulfite or calcium sulfate, which are removed by dewatering and settling into a thickener. The FGD wastes are usually mixed with the fly ash collected in the fabric filter or ESP and lime in a pug mill, and they are disposed of in landfills.

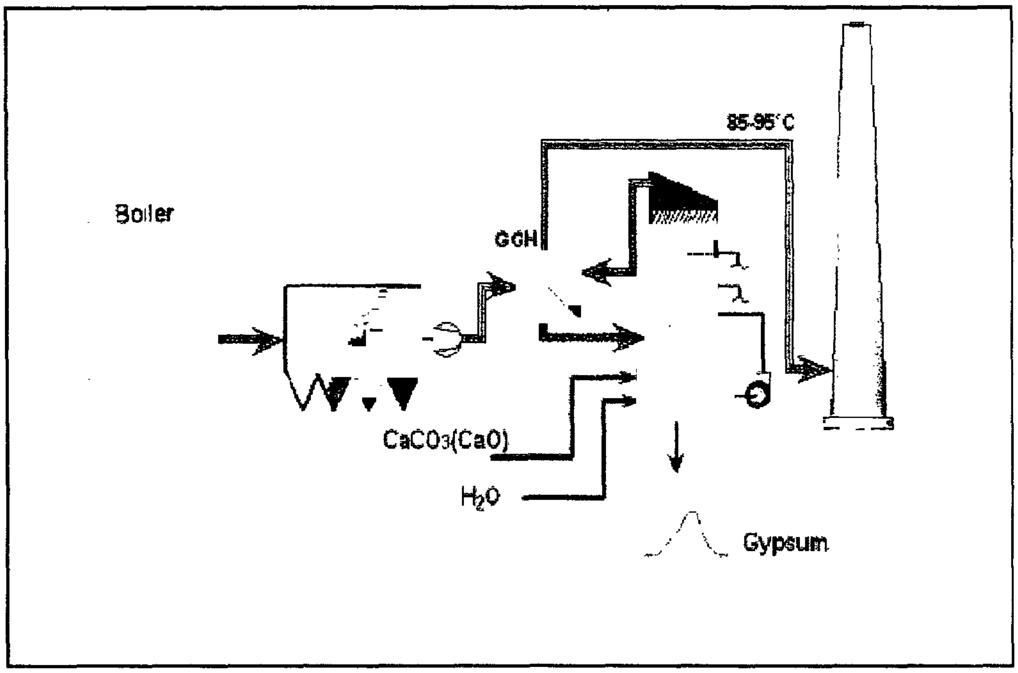


Figure IV.2.1.1. Conventional Limestone/Lime Flue-Gas Desulfurization

In the early years of introduction of FGD technology, a spare absorber was included to allow full-load operation with one absorber out of service. Recent improvements in reliability have contributed to the elimination of the spare module in most installations. Presently, the largest capacity scrubber module can handle flue gas approximately equivalent to that of a 1000 MW coal power plant.

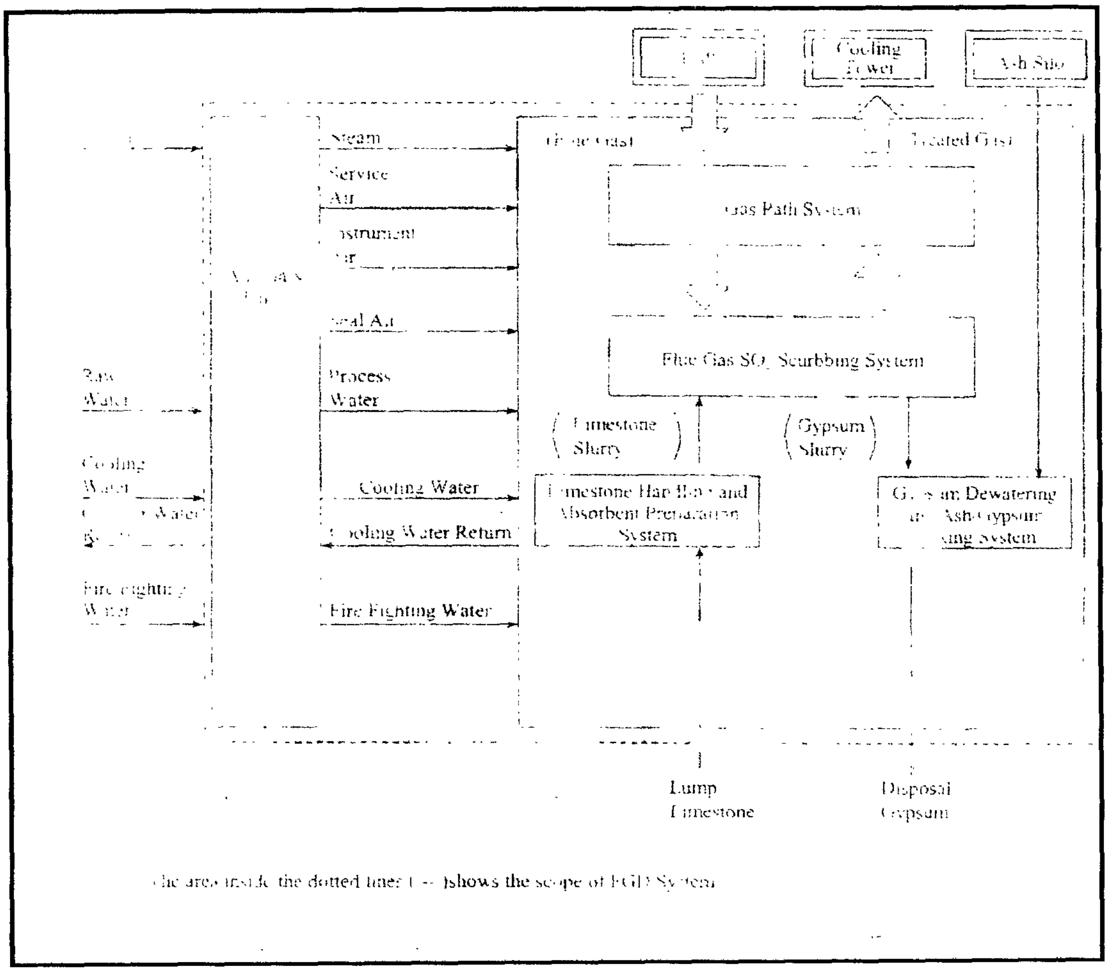


Figure IV.2.1.2. Flow Chart of Flue-Gas Desulfurization Interaction with Whole System

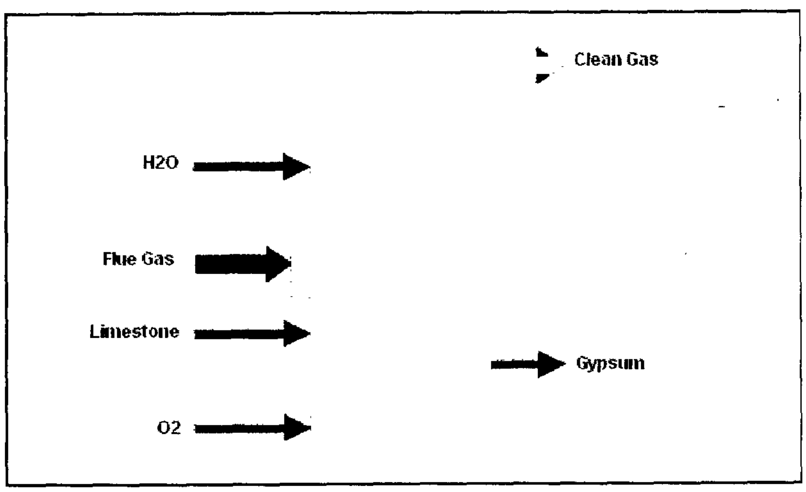


Figure IV.2.1.3. Scrubber of FGD System

Cooling Tower Discharge

Discharging cleaned flue gases into the atmosphere can be made by injecting the gas into the natural draught cooling tower plume and to discharge it together with this plume, i.e. to use the energy of the cooling tower plume to emit the clean gas. Discharging cleaned flue gases via a cooling tower into the air was first put into practice at the Völkingen prototype power station in 1980. The results obtained from measurements confirmed the theoretical forecast and proved that the column shaped cooling tower plume achieved significantly greater buoyancy than a corresponding flue gas plume due to the high heat flow. It can also penetrate inversion layers. The dispersion of the pollutants contained in the plume/flue gas mixture is therefore better and the resultant local concentration on ground level is significant lower than that of a chimney of the same height. This was the reason to install this process in AEBTPP. Therefore, implementation of a FGD in plant AEATPP will be same with AEBTPP.

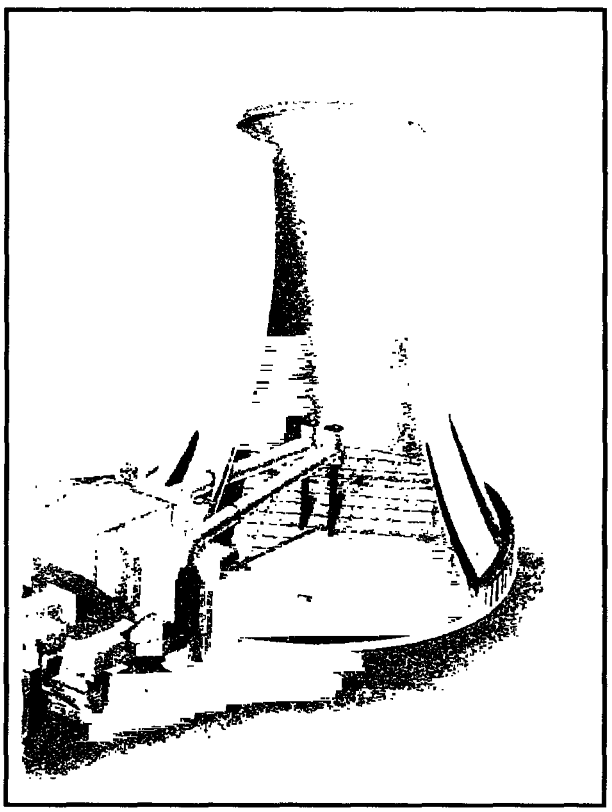


Figure IV.2.1.4. Cooling Tower Discharge of the Gases from FGD Plant

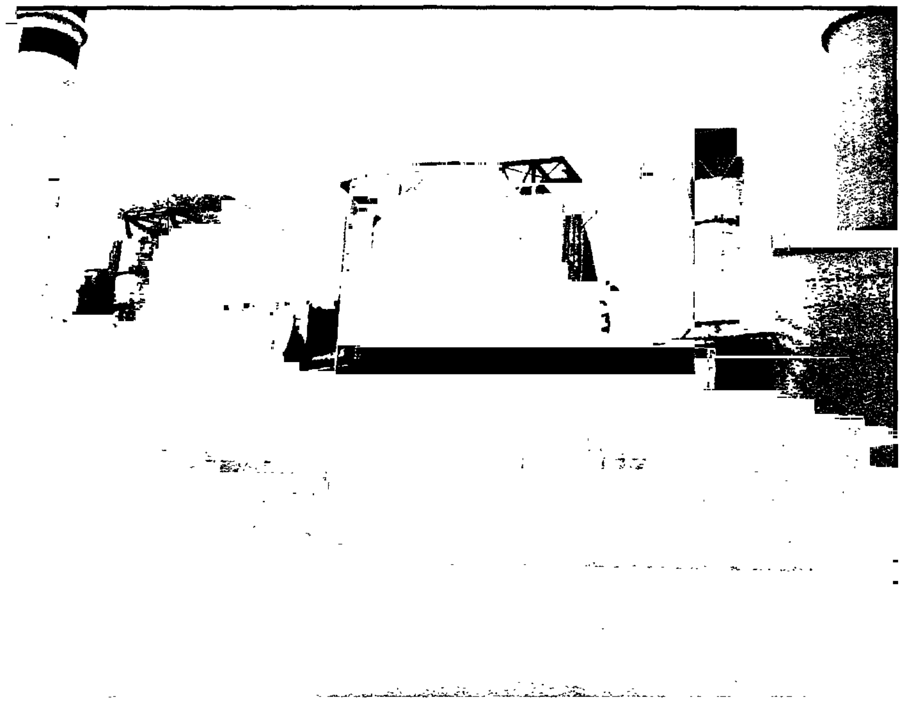


Figure IV.2.1.5. Connection of the FGD Unit and Cooling Tower in AEBTPP

IV.2.2. Characteristics, Supply, Transport and Storage of Limestone and Other Raw Material Required For the Project Needed For Project Activities, the Mode of Transport and Vehicle, Their Quantities and Vehicles, Storage and Crushing/Sieving Process

The lignite coal taken from AEL Open Mining Area is stored in main coal bunkers with the aid of two conveyors, each of which has a capacity of 4900 t/h. Coal coming to the crushers via 4 vibrating extractor which is placed under the bunker, are broken into pieces till they get sizes of 0-60 mm. Meanwhile, stone, wooden and such pieces found in the coal are separated. The metallic particles which can be joined in the coal are separated with the aid of magnetic separators. The operations done up to so far are done in the crushing building. Also, there is a sampling system in the coal crushing building which is used to detect the characteristics of the coal. Samples taken are analyzed in the laboratories and the humidity, CaO, calorie and ash rates of the coal are detected. Characteristics of the coal including humidity, CaO, calorific value and ash content are given in the Section IV.2.5.

After processed in the coal crushing building, coal is sent to the bunkers of the units via two conveyers, each of which has a capacity of 4000 t/h. Since there have been 4 units, there has been 6 bunkers in each unit, each of which has a capacity of 495 m^3. Coal is extracted with the aid of blendomats; these are below the bunker. Then coal is transported via conveyors to the mills, which are used to grind the coal. Here, it is grinded till it has sizes about 0-2 mm and at the same time; it is dried in order remove the humidity inside the particles.

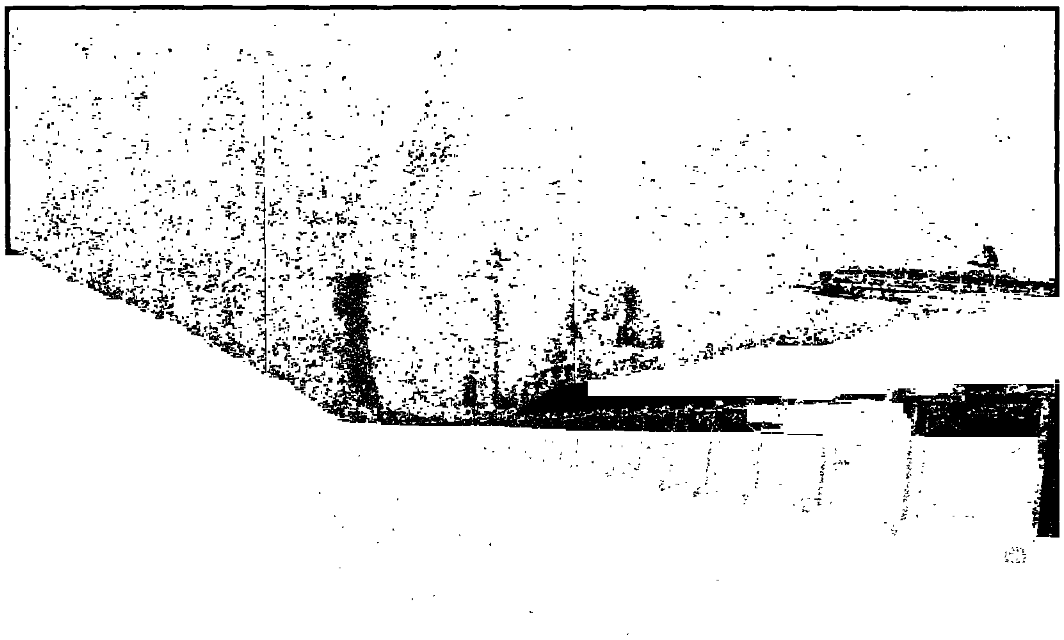


Figure IV.2.2.1. Coal Stock Site

Limestone that will be used during the operation of the FGD unit will be supplied from Mırmırın Hill Limestone Site that is 4 km far from the power plant. Area of the limestone site is 1.5 km^2 and the transportation from the limestone site will be by the trucks. MTA was conducted a preliminary survey at this site in 1992 and as a result of this study, the site was determinated as the source for FGD plant. In 1993, 1/2000 scale map of a part of Mırmırın Hill Region was planned and detailed geological map was conducted.

Chemical analysis results of the samples from limestone site shows that CaO_3 %, SiO_2 and R_2O_3 values of the samples meet the requirements of limestone characteristics needed for FGD unit and limestone parameters at the site shows homogeneous distribution.

103,000,000 ton granular and probable reserve was determined in the Mırmırın Hill Limestone Site. Limestone analysis is given by the Annex B9. Characteristics of the limestone as follows:

Amount	: 2,100,000 - ton/year (tuvenan)
Chemical Characteristics	: $CaCO_3$- min 90%
	SiO_2- max 3%
	MgO- max 3%
	R_2O_3- max 4%
	Moisture- max 5%

Particle size will be 0-60 mm.

Figure IV.2.1.2. Limestone Storage Building of AEBTPP

IV.2.3. Amount of Water to Be Used For All Process, Amount of Drinking and Consumption Water, Water Supply Plan, Pretreatment Processes (Treatment Units), Water Preparation Flowchart, Chemicals to Be Used

In the existing situation, all of the water required for process (feed water and cooling water) and domestic demand of AEATPP is supplied from Ceyhan River Spring in Elbistan. Water is pumped to the power plant by four pumps each has 1800 m^3/h capacity and two steel lines with 1 meter diameter and 30 km length are being used for this purposes.

Figure IV.2.3.1. Ceyhan River Spring

Water consumption in AEATPP during year 2002 is stated by the table below.

Table IV.2.3.1 Water Consumption in Year 2002 (m^3/year)

For process	
Ash moisturizing, feed water for boiler	reused
Additional boiler water	821,961
Additional main cooling water	10,597,667
Additional secondary cooling water	86,208
Total	11,505,836
Other purposes	
Domestic use	450000
Fire fighting +garden irrigation	2,628,000
Total amount of water used for other purposes	3,078,000
Amount of water consumed	14,583,836

Source: Operational Directorate of AEATPP

Raw water line currently feeding the AEATPP has a capacity of 7200 m^3/h and the current maximum demand of AEATPP is 4300 t/h. Retrofitted FGD unit of the AEATPP after the second phase of the project will require 1000 t/h water supply. Therefore, the current source, namely Ceyhan Spring is enough for both the water demand of process and FGD of AEATPP.

In the current situation, incoming water is demineralized before it is used in the process. Same procedure will be applied after the FGD retrofitted. The demineralization plant is shown by the picture below.

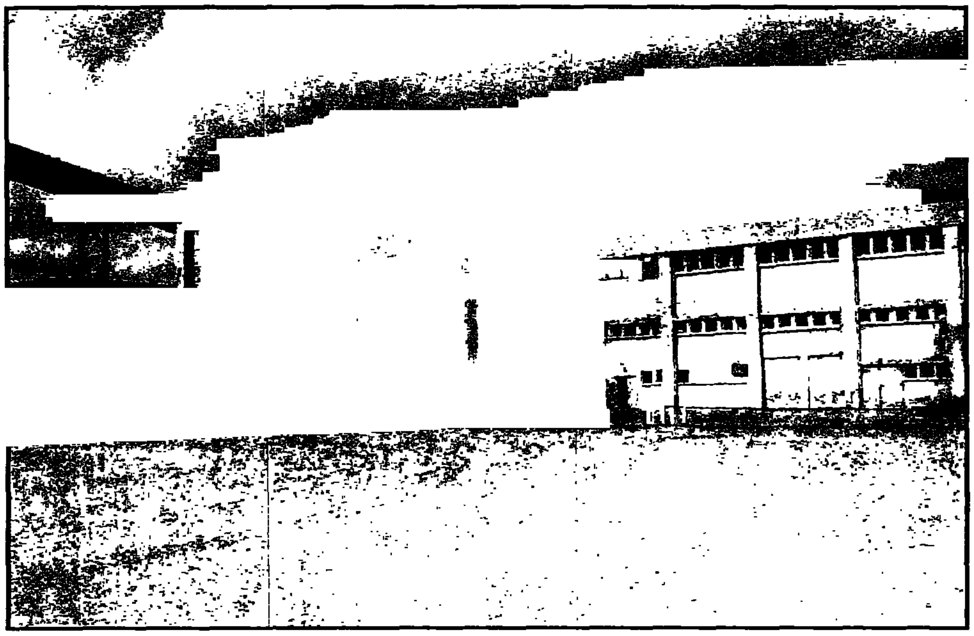


Figure IV.2.3.2. Demineralization Plant

AEATPP has also a drinking water plant. Drinking water treatment plant consists of the following units:

- Drinking water tanks
- Activated carbon filters
- Air pressure tank
- Blower station
- Chlorination
- Activated carbon backwashing

Circulated cooling water system

Maximum concentrations in the circulation water will be like below:

Table IV.2.3.2. Circulating Water Characteristics

pH		6-8
Carbonate hardness	mval/l	2.5-4.3
Non-carbonate hardness	mval/l	25
Cl	mval/l	11-17
SO_4	mval/l	10-17
Total salt content	ppm	3000
Temperature		
Maximum peak	°C	32
Normal	°C	22
Minimum peak	°C	<10

IV.2.4. Physical and Chemical Characteristics of the Wastewater, Quantity of Wastewater, Parameters to be Treated at Treatment Plants and Treatment Processes, Amount of Treated Wastewater and How and to Which Receiving Environment These Treated Wastewaters Will Be Discharged

Based on the current data, wastewater and reused water of AEATPP are stated in tabular form below.

Reused water (m^3/year):

Type of water reused	: Reused without treatment
From where	: Additional main cooling water
Amount of water to be reused	:1,617,750
Where it is reused:	
Boiler blowdown	1,617,750
Ash moisturing	2,696,250

Table IV.2.4.1. Classification of the Discharged Wastewater (m^3/year)

Type of wastewater		Amount (m^3/year)
Water preparation	Sand filters backwashing wastewater	95,875
	Water treatment and condensed treatment wastewater	72,583
Boiler blowdown	Boiler deslagger wastewater and moisturizing water	4,314,000
Cooling water	Closed circuit	6,283,667
Intermittent wastewater	From boiler	400,000
Domestic wastewater		400,000
TOTAL		11,566,125

Source: Operational Directorate of AEATPP

Rain waters and groundwater have been collected by existing drainage system in AEATPP.

Industrial Wastewater

Boiler blowdown wastewaters will be reused, if it is not reused, flowing discharge standards will be met and it will be conveyed to general discharge system.

Table IV.2.4.2. Coal Preparation, Processing and Energy Generation Plants (Boilers Blowdown) Wastewater Discharge Standards

Parameters	Discharge Limits	
	Instant Sample	Composite Sample of 2 Hours
Settleable solids (mg/l)	0.3	-
Hydrazine (mg/l)	5	-
Total Phosphorous (mg/l)	-	8
Vanadium	-	3
Iron	-	7

Source: RWPC

Cooling water blowdown will met the following limits.

Table IV.2.4.3. Coal Preparation, Processing and Energy Generation Plants (Cooling Water) Wastewater Discharge Standards

Parameter	Discharge Limits	
	Composite Sample of 2 hours	Composite Sample of 24 hours
Chemical Oxygen Demand (mg/l)	40	-
Suspended Solids (mg/l)	100	-
Free Chlorine (mg/l)	0.3	-
Total Phosphorous (mg/l)	5	-
Zinc (mg/l)	4	-
TDS	: approx. 3000 ppm	
Cr^{+6}	: 0.1 mg/l	

Source: RWPC and international standards for TDS and Cr

Regeneration wastewater will be used for neutralization. If it is discharged, the following limits will be met.

Table IV.2.4.4 Water Softening, Demineralization and Regeneration, Activated Carbon Washing and Regeneration Plants Wastewater Discharge Standards

Parameters	Discharge Limits	
	Composite Sample of 2 hours	Composite Sample of 24 hours
Chloride (mg/l)	2000	1500
Sulfate (mg/l)	3000	2500
Iron (mg/l)	10	-
Fish bioassay (ZSF)	10	-
pH	6-9	6-9

Source: RWPC

The general discharge limits for the coal-firing power plants in Turkey is presented below. These standards will be met during operation phase of the project.

Table IV.2.4.5. Coal Preparation, Processing and Energy Generation Plants (Thermal Power Plants and etc.) Discharge Standards

Parameters	Discharge Limits	
	Composite Sample of 2 hours	Composite Sample of 24 hours
Chemical oxygen demand (mg/l)	60	30
Suspended solids (mg/l)	150	100
Oil and grease (mg/l)	20	10
Total Phosphorous (mg/l)	8	-
Total cyanide (mg/l)	-	0.5
Temperature (^{o}C)	-	35
pH	6-9	6-9

Source: RWPC

Article 26-f of Regulation on Water Pollution Control states that "If an industrial plant comprises sectors more than one or subsectors of one sector, the discharge parameters of the sector of which wastewater amount is higher are essential. However, if some of the parameters for the wastewater with lower flow rate are available, these also taken in to account." This issue will be taken into account in the power plant.

Domestic Wastewater Treatment Plant

Wastewater treatment plant is composed of the following units:

- Intake conduit

- Comminutor

- Aeration tank (activated sludge system)
- Settling tank
- Sludge pumping station
- Surplus sludge storage tank

Effluent from wastewater treatment plant will have the following characteristics stated at Table 21 of Water Pollution Control Regulation.

Operation statistics:

Capacity: 15 m^3/h (average)

36 m^3/h (maximum)

Treated water effluent guaranteed values:

BOD_5 < 25 mg/l

BOD_5 dissolution > 90%

Suspended Solids < 0.3 mg/l

Sewage treatment plant is given by Annex B4.

Ash Water Treatment System

Purpose of ash water clarification plant (AWCP) is to purify mechanically by sedimentation of the effluents of the "wet slag extractors" of the 4 boilers and of the "water treatment plant".

Capacity:

Table IV.2.4.6. Capacity of Ash Water Treatment System

	Min.	normal	Max.
Of 4 wet slag extractors min. 4x120	480		
Normal 4x240		960	
Maximum 5x500			2000
Wastewater from WTPs	120	240	510
Total	600	1200	2510

The total capacity of AWCP was determined with 2200 m^3/h at a maximum.

Temperature : 40 to 80 °C

pH value : 7 to 11

Suspended matter : 2 to 20 g/l

Precipitation : approx. 25-50 cn per hour

TDS : approx. 3000 ppm

The AWC basically consists of:

2 sand separators

2 flocculation basins

2 longitudinal settling basins

3 drainage basins

and the necessary pumping stations.

Measurements of the AWC should be conducted as it is stated its operation and maintenance manual.

Ash water treatment plant is given by Annex B3.

Ash, slag and gypsum produced at power plant are sent to mining site by the closed conveyors.

IV.2.5. Amount of Fuels to Be Used, Combustion System, Emissions, Mitigation Measures and Efficiency of These Measures, Method of Modeling Study, Description of The Model, Meteorological Data Used (Precipitation, Wind, Atmospheric Stability, Mixing Height etc.), Model Inputs, Modeling Results Considering the Worst-Case Scenario, Possible Impacts, Suggested Measures, Illustration of Output of the Modelling Results on Landuse Map

Kışlaköy lignites are used as fuel in AEATPP. Annual 7.319.037 tons fuel is consumed (2002 value). Industrial and elemental analyses of the Kışlaköy lignites are given by the table below.

Table IV.2.5.1. Coal Analysis Results

Sampling point : 4.Unit Bunker

Sampling date: 22.11.89

Loss from drying on air: %46.93

Industrial Analysis of Kışlaköy Lignites (%)

	In original coal	In air dry coal	Dry coal	In Pure coal
Moisture (%)	52.45	10.4	0	0
Ashes	19.15	36.08	40.27	0
Volatile materials	19.37	36.5	40.74	68.2
Constant C	9.03	17.02	18.99	31.8
Total	100	100	100	100
Thermal Value (cal/g)				
Upper thermal value	1666	3140	3504	5866
Lower thermal value	1308	2971	3382	5662
Elemental Analysis of Kışlaköy Lignites (%)				
Moisture	52.45	10.4	0	0
Ash	19.15	36.08	40.27	0
Carbon	18.34	34.55	38.56	64.55
Hydrogen	1.13	2.12	2.37	3.97
Sulfur (combustable)	0.55	1.04	1.16	1.94
Nitrogen+Oxygen	8.38	15.81	17.64	29.54
Total	100	100	100	100
Sulfur Types (%)				
Total Sulfur	1.74	3.28	3.66	
Sulfur in ash	1.19	2.24	2.5	
CO_2	3.11	5.86	6.54	
Hardgrove grindability index:	53			

According to the stack gas emission report of TUBITAK-MAM prepared at the year 2000, stack gas SO_2 and PM concentrations are given below:

Table IV.2.5.2. Unit 1 Main Stack Measurement Results

Stack Diameter	: 6.8 m	
Stack area	: 36.62 m^2	
Stack gas velocity	: 24 m/s	
Stack gas flow rate	: 1,514,757 Nm^3/h (dry) 1,793,472 Nm^3/h (wet)	
Stack gas temperature	: 213 °C	
Stack gas pressure	: 40.79 mmSS 870 mbar	
Stack gas moisture	: 15.5 [%H_2O] wet basis 148 g/Nm^3 normal condition	
Coal rate	: 575-750 ton/h	
Dust and Gas Pollutants:		
Component	**Concentration (mg/Nm^3)**	**Mass flow rate (kg/h)**
SO_3 [mg/Nm^3] dry basis	91-159	138-240
SO_3 [mg/Nm^3] wet basis	76-142	136-254
SO_2 [mg/Nm^3] dry basis	2057-13855	3116-21032
SO_2 [mg/Nm^3] wet basis	1737-11727	3115-21032
CO [mg/Nm^3] dry basis	None	None
CO [mg/Nm^3] wet basis	None	None
NO_X [mg/Nm^3 NO_2] dry basis	470	711
NO_X [mg/Nm^3 NO_2] wet basis	397	712
O_2 [%] wet basis	5.9-7.1	-
CO_2 [%] wet basis	12.6-13.7	-
PM [mg/Nm^3] dry basis	409.5	620
PM [mg/Nm^3] wet basis	346	620.5
HF [mg/Nm^3] dry basis	26.8	40.7
HF [mg/Nm^3] wet basis	22.7	40.7
HCl [mg/Nm^3] dry basis	18	27.3
HCl [mg/Nm^3] wet basis	15.2	27.4

Source: TUBİTAK-MAM Report, 2000

Table IV.2.5.3. Unit 1 Bruden Stack 1, 2 and 3 Measurement Results

Stack Diameter	: 3 m		
Stack area	: 7.07 m^2		
Stack gas velocity	: 15.8 m/s		
Stack gas flow rate	: 292,390 Nm^3/h (dry) 397,514 Nm^3/h (wet)		
Stack gas temperature	: 99 °C		
Stack gas pressure	: 864 mbar		
Stack gas moisture	: 36.5 [%H_2O] wet basis 462 g/Nm^3 normal condition		
Coal rate	: 575-750 ton/h		
Dust and Gas Pollutants:			
Component	**Concentration (mg/Nm^3)**	**Concentration (mg/Nm^3)**	**Concentration (mg/Nm^3)**
SO_3 [mg/Nm^3] dry basis	None	None	None
SO_3 [mg/Nm^3] wet basis	None	None	None
SO_2 [mg/Nm^3] dry basis	56	31	26
SO_2 [mg/Nm^3] wet basis	36	19	18
CO [mg/Nm^3] dry basis	256	93	100
CO [mg/Nm^3] wet basis	162	59	71
NO_X [mg/Nm^3 NO_2] dry basis	395	297	270
NO_X [mg/Nm^3 NO_2] wet basis	250	186	191
O_2 [%] wet basis	11-11.2	10-10.1	9.3-9.5
CO_2 [%] wet basis	8.9-9.1	9.5-9.7	10.1-10.6
Dust [mg/Nm^3] dry basis	2171	8078.5	1293
Dust [mg/Nm^3] wet basis	1380	5061	914.8
HF [mg/Nm^3] dry basis	16.9	33	15.1
HF [mg/Nm^3] wet basis	10.7	11.4	11
HCl [mg/Nm^3] dry basis	21.6	42.5	29.3
HCl [mg/Nm^3] wet basis	13.7	26.7	20.8

Source: TUBİTAK-MAM Report, 2000

AIR QUALITY DISPERSION MODELLING STUDY

For dispersion of emissions from the power plant, air quality dispersion modelling was applied both for the existing situation of the power plant and for 3 different scenarios. First case designates the existing situation of the power plant; second case is formed for no FGD situation where PM emission is limited to 100 mg/Nm^3 by the use of ESPs (the World Bank Project). Third case includes the use of FGD where PM concentration is again limited to 100 mg/Nm^3. Finally, fourth case is considered with FGD option where PM concentration is limited to 50 mg/Nm^3. For each case, the contribution of AEBTPP was also taken into account.

These scenarios are explained in detail as follows.

1. Existing Situation of Afşin-Elbistan Plant A

The units operated with a capacity less than 26% during the years 2002 and 2003. However, emission measurements were conducted in the year 2000. The capacity factor was 39.61% (3500 hours/year) for the year 2000.

Calculation of Emissions for the Existing Situation

All assumptions given below is based on the measurement reports of TUBITAK-Marmara Research Center. In addition to that Chubu and STEAG reports are used in the calculation as a reference.

- *Main stack*

All amounts are based on an average of unit 1 and unit 3. The concentrations given in the Chubu and STEAG reports are used in the calculations. Each unit has 1 main stack and 3 Bruden stacks. All data is based on the measurements conducted in August 2000 by TUBITAK-Marmara Research Center.

The average real wet velocity of the flue gas is determined to be 22.75 m/s with 15% H_2O. The average temperature is 210 °C and the cross-sectional area of the stack is 36.32 m^2.

The emission flow rate at normal conditions (0 °C, 1 atm, dry gas, 6% O_2) is:

$$Q_w = (22.75\,m/s)\times\left(\frac{273\,K}{483\,K}\right)\times(36.32\,m^2) = 467.0\,m^3/s \quad (on\,wet\,basis)$$

$$Q_d = (467.0\,m^3/s)\times(1-0.15) = 397\,m^3/s \quad (on\,dry\,basis)$$

- *Bruden stacks*

The average real wet velocity is 28.33 m/s with 30% H_2O. The average temperature is 105 °C. The cross-sectional area of the stack is 7.07 m^2.

The emission flow rate at normal conditions (0 °C, 1 atm, dry gas, 6% O_2) is:

$$Q = (23.5\, m/s) \times \left(\frac{273\,K}{378\,K}\right) \times (7.07\, m^2) = 120\ m^3/s\ \ (on\, wet\, basis)$$

$$Q_d = (120\, m^3/s) \times (1 - 0.30) = 84\, m^3/s\ \ (on\ dry\, basis)$$

➢ <u>*Emissions*</u>

SO_2

The average sulphur content of the lignite is 0.8%. In 2000, the coal consumption was 11,000,000 ton/year and the power plant was operating with a capacity factor of 39.61% (3500 hours/year). According to this, SO_2 emission to be produced will be;

$$\left(11{,}000{,}000 \frac{ton\, coal}{year}\right) \times \left(\frac{0.8\ ton\, S}{100\ ton\, coal}\right) \times \left(\frac{64\, g/mol\ SO_2}{32\, g/mol\, S}\right) = 176{,}000\ \frac{ton\, SO_2}{year}$$

Therefore, total SO_2 emission arising from the power plant is;

$$\frac{176{,}000\ ton\, SO_2/year}{3500\, h/year} \cong 50\ ton\, SO_2/h$$

and the amount of SO_2 emission for each unit is;

$$\frac{50\ ton\, SO_2/hr}{4\, units} = 12.5\ ton\, SO_2/h/unit$$

12.5 tons of SO_2 per hour per each unit is distributed among the main stack and burden stacks as;

Main stack	11.0 t/h
Bruden stack –1	0.5 t/h
Bruden stack –2	0.5 t/h
Bruden stack –3	0.5 t/h

NO_x

The results of measurements indicated in the TUBITAK MAM's report comply with each other. The total emission of unit 1 is determined as 1060 kg/h and for unit 3 as 896 kg/h. The approximate average of these data is found as 980 kg/h. The measurements show that about 70% of the NOx emissions are due to the main stack and 10% of the emissions are due to each Bruden stack. According to this;

0.7 x 980 = 686 kg/h of NOx is emitted through main stack

0.1 x 980 = 98 kg/h of NOx is emitted through each Bruden stack

Main stack	686 kg/h
Bruden stack –1	98 kg/h
Bruden stack –2	98 kg/h
Bruden stack –3	98 kg/h

PM_{10}

The results of measurements indicated in the TUBITAK MAM's report comply with each other. The total emission of unit 1 is determined as 5436 kg/h and for unit-3 as 6663 kg/h. The average of these is 6050 kg/h, which is approximated as 6 t/h. It is estimated from the Report that 50% of the PM emissions is due to the main stack and the rest is due to Bruden stacks. According to this;

$(6\ ton/h) \times 0.50 = 3\ ton\, PM/h$ is emitted through main stack and 1 ton/h is emitted through each Bruden stack.

Main stack	6 t/h
Bruden stack –1	1 t/h
Bruden stack –2	1 t/h
Bruden stack –3	1 t/h

➢ *By use of the data given above, the stack gas concentrations are calculated as:*

Main stack:

SO_2 $$\frac{(11000\,kg/h) \times \left(1h/3600\,s\right) \times \left(10^6\,mg/kg\right)}{397\,m^3/s} = 7697\,mg/m^3$$

NO_x $$\frac{(686\,kg/h) \times \left(1h/3600\,s\right) \times \left(10^6\,mg/kg\right)}{397\,m^3/s} = 480\,mg/m^3$$

PM_{10} $$\frac{(3000\,kg/h) \times \left(1h/3600\,s\right) \times \left(10^6\,mg/kg\right)}{397\,m^3/s} = 2099\,mg/m^3$$

Bruden stacks:

SO_2 $$\frac{(500\,kg/h) \times \left(1h/3600\,s\right) \times \left(10^6\,mg/kg\right)}{120\,m^3/s} = 1157.4\,mg/m^3$$

NO_x $$\frac{(98\,kg/h) \times \left(1h/3600\,s\right) \times \left(10^6\,mg/kg\right)}{120\,m^3/s} = 226.9\,mg/m^3$$

PM_{10} $$\frac{(1000\,kg/h) \times \left(1h/3600\,s\right) \times \left(10^6\,mg/kg\right)}{120\,m^3/s} = 2314.8\,mg/m^3$$

Therefore, the main input parameters for modeling of the existing situation are summarized as follows:

Main stack

– height stack	145	m
– flue gas quantity (dry, 6% O_2)	397	m^3/s
– flue gas temperature	210	°C
– SO_2	11000	kg/h
– NO_x	686	kg/h
– PM_{10}	3000	kg/h

3 Bruden stacks (for each one)

– height of the stack	120	m
– flue gas quantity (dry, 6% O_2)	120	m^3/s
– flue gas temperature	105	°C
– SO_2	500	kg/h
– NO_x	98	kg/h
– PM_{10}	1000	kg/h

2. Base Scenario (PM_{10} emission is limited to 100 mg/m^3 by ESP without FGD)

All units will be operating for 6,500 hours per year. There will not be an FGD but there will be new ESPs for all stacks. Bruden stacks will continue to be used. The total SO_2 and NOx emissions will be 9.1 t/h while the emissions are distributed as 1/3 rd of emissions will originate from the 3 Bruden stacks at each unit and the remaining will be emitted from main stack. In this case the emissions will became, 6.1 t/h SO_2 from main stack and 1 t/h SO_2 from each Bruden stacks and 650 kg/h NOx from main stack and 110 kg/h NOx from each Bruden stacks. Calculation of SO_2 emission is explained in detailed below (calculation of emissions for base scenario). Although the annual coal consumption is higher than the amount used in the existing situation scenario, SO_2 emission (as tons/h) is lower. The reason for that is the improved plant efficiency which results in increase in capacity factor and thus operation hours (6500 h/yr). NOx emission is assumed to remain the same after rehabilitation of the power plant. NOx emission is assumed to remain the same after rehabilitation of the power plant.

Calculation of Emissions for Base Scenario

The flue gas flow was indicated in the STEAG Report as 2,100,000 m^3/h (at 0°C, 1 atm.) for the rehabilitation. This flow was based on the idea that all flue gas should flow through the main stack. In the new base case 2/3 of the total emission flows through the main stack = 1,400,000 m^3/h and the remaining 700,000 m^3/h flows through 3 Bruden stacks (233,333 m^3/h through each burden stack). These flows are based on the design characteristics of the boiler.

- *Emissions*

SO_2

The average sulphur content of the lignite is 0.8%. Total coal consumption will be 14,780,000 ton/year. The power plant will be operating 6500 hours per year.

$$\left(14{,}780{,}000\frac{ton\,coal}{year}\right)\times\left(\frac{0.8\ ton\,S}{100\ ton\,coal}\right)\times\left(\frac{64\,g/mol\ SO_2}{32\,g/mol\,S}\right)=236{,}480\ \frac{ton\,SO_2}{year}$$

Therefore, total SO_2 emission arising from the power plant will be;

$$\frac{236{,}480\ ton\,SO_2/year}{6500\,h/year}=36.38\ ton\,SO_2/h$$

and the amount of SO_2 emission for each unit will be;

$$\frac{36.38\ ton\,SO_2/hr}{4\,units}=9.1\ ton\,SO_2/h/unit$$

It is assumed that 6.1 t/h is emitted through the main stack and the remaining 3t/h is emitted through 3 Bruden stacks (1 t/h each burden stack).

Main stack	6.1 t/h
Bruden stack –1	1.0 t/h
Bruden stack –2	1.0 t/h
Bruden stack –3	1.0 t/h

NO_x

980 kg/h x 2/3 = 650 kg/h of NOx is emitted through main stack

980 kg/h x 1/3 = 330 kg/h of NOx is emitted through the Bruden stacks

Main stack	650 kg/h
Bruden stack –1	110 kg/h
Bruden stack –2	110 kg/h
Bruden stack –3	110 kg/h

PM_{10}

$(1{,}400{,}000\, m^3/h)\times(100\, mg/m^3)\times(kg/10^6\, mg) = 140\, kg/h$ is emitted through main stack

$(233{,}000\, m^3/h)\times(100\, mg/m^3)\times(kg/10^6\, mg) = 23.3\, kg/h$ is emitted through each Bruden stack.

Main stack	140 kg/h
Bruden stack –1	23.3 kg/h
Bruden stack –2	23.3 kg/h
Bruden stack –3	23.3 kg/h

➢ *Stack gas concentrations:*

Main stack:

SO_2 $$\frac{(6.1\, ton/h)\times(10^9\, mg/ton)}{1{,}400{,}000\, m^3/h} \cong 4357\, mg/m^3$$

NO_x $$\frac{(650\, kg/h)\times(10^6\, mg/kg)}{1{,}400{,}000\, m^3/h} = 464.3\, mg/m^3$$

PM_{10} after installation of ESP, PM concentration will be 100 mg/m^3

Bruden stacks:

SO_2 $$\frac{(1\, ton/h)\times(10^9\, mg/ton)}{1{,}400{,}000\, m^3/h} = 4286\, mg/m^3$$

NO_x $$\frac{(110\, kg/h)\times(10^6\, mg/kg)}{1{,}400{,}000\, m^3/h} = 471\, mg/m^3$$

PM_{10} after installation of ESP, PM concentration will be 100 mg/m^3

Therefore, the main input parameters for the modeling of the base case are summarized as follows:

Main stack

– height stack	145	m
– flue gas quantity (dry, 6% O_2)	389	m^3/s
– flue gas temperature	175	°C
– SO_2	6100	kg/h
– NO_x	650	kg/h
– PM_{10}	140	kg/h

3 Bruden stacks (for each one)

– height of the stack	120	m
– flue gas quantity (dry, 6% O_2)	65	m^3/s
– flue gas temperature	175	°C
– SO_2	1000	kg/h
– NO_x	110	kg/h
– PM_{10}	23.3	kg/h

3. Alternative 1 with FGD (PM_{10} emission is limited to 100 mg/m^3 by ESP and SO_2-emission is limited to 1000 mg/m$_0^3$ by FGD)

All emissions from the FGD are conveyed to the cooling tower with a flue gas flow rate of 2,100,000 m^3/h, the SO_2-emission is 2.1 t/h. In this case, the FGD efficiency will be 77%. Although higher efficiency is possible, for compliance with Turkish Regulations 77% ((9.1-2.1)/9.1=77%)is considered to be adequate and SO_2 concentration is taken as 1000 mg/m^3.

Cooling tower

– height of tower	106	m
– diameter of the tower	60	m
– velocity flue gas and vapor	7.5	m/s
– vapor temperature	50	°C
– SO_2	2100	kg/h
– NO_x	980	kg/h
– PM_{10}	210	kg/h

4. Alternative 2 with FGD (PM_{10}-emission is limited to 50 mg/m^3 by ESP and SO_2-emission is limited to 1000 mg/m$_0^3$ by FGD)

All emissions from the FGD are conveyed to the cooling tower.

Cooling tower

– height of the tower	106	m
– diameter of the tower	60	m
– velocity flue gas and vapor	7.5	m/s
– vapor temperature	50	°C
– SO_2	2.1	t/h
– NO_x	980	kg/h
– PM_{10}	105	kg/h

None of the alternatives discussed above has impact on reduction of NO_x-emissions. Therefore, in all cases NO_x-emissions will stay the same as it is for the existing situation. After the rehabilitation, it is expected that the boiler will operate properly.

Modeling Approach

Dispersion calculations are carried out by use of the following elements:

- emission data,
- surface parameters,
- meteorological data
- and dispersion model.

Industrial Source Complex Short Term Version 3 (ISCST3) computer model, which is developed by U.S. Environmental Protection Agency (EPA), is used to model the dispersion of air pollutants in the study area. The basis of the model is the steady-state Gaussian plume equation, which is used with some modifications to calculate the dispersion of various air pollutants from several kinds of sources. Emission sources are categorized into four basic types of sources, such as; point, volume, line and area sources or a complex of 2 or more of these sources.

ISC model developed by the U.S. EPA is one of the most widely used model in the world. It is accepted worldwide by the regulatory authorities, researchers and decision-makers for estimating concentrations of non-reacting air pollutants up to 50 kilometers away from the source.

Inputs of ISCST3 Model

There are three types of inputs that are needed to run the ISCST model. They are;

- Topographical input,
- The meteorological data and
- Input run stream file.

The run stream setup file contains the selected modelling options (rural or urban, flat or elevated terrain), as well as source location and parameter data like: pollutant emission rate, stack height, gas temperature, gas exit velocity, internal diameter of stack, averaging time, concentration and/or deposition estimates etc. Receptor data provides the location where a predicted concentration is desired.

Topographical Map

Topographical map of the study area is given in Figure IV.2.5.1. Topographical input data for each receptor is included in the modelling calculations and served for the following purposes:

- Terrain data input to the ISCST3 model, and
- Location of exact positions of point sources present in the study area.

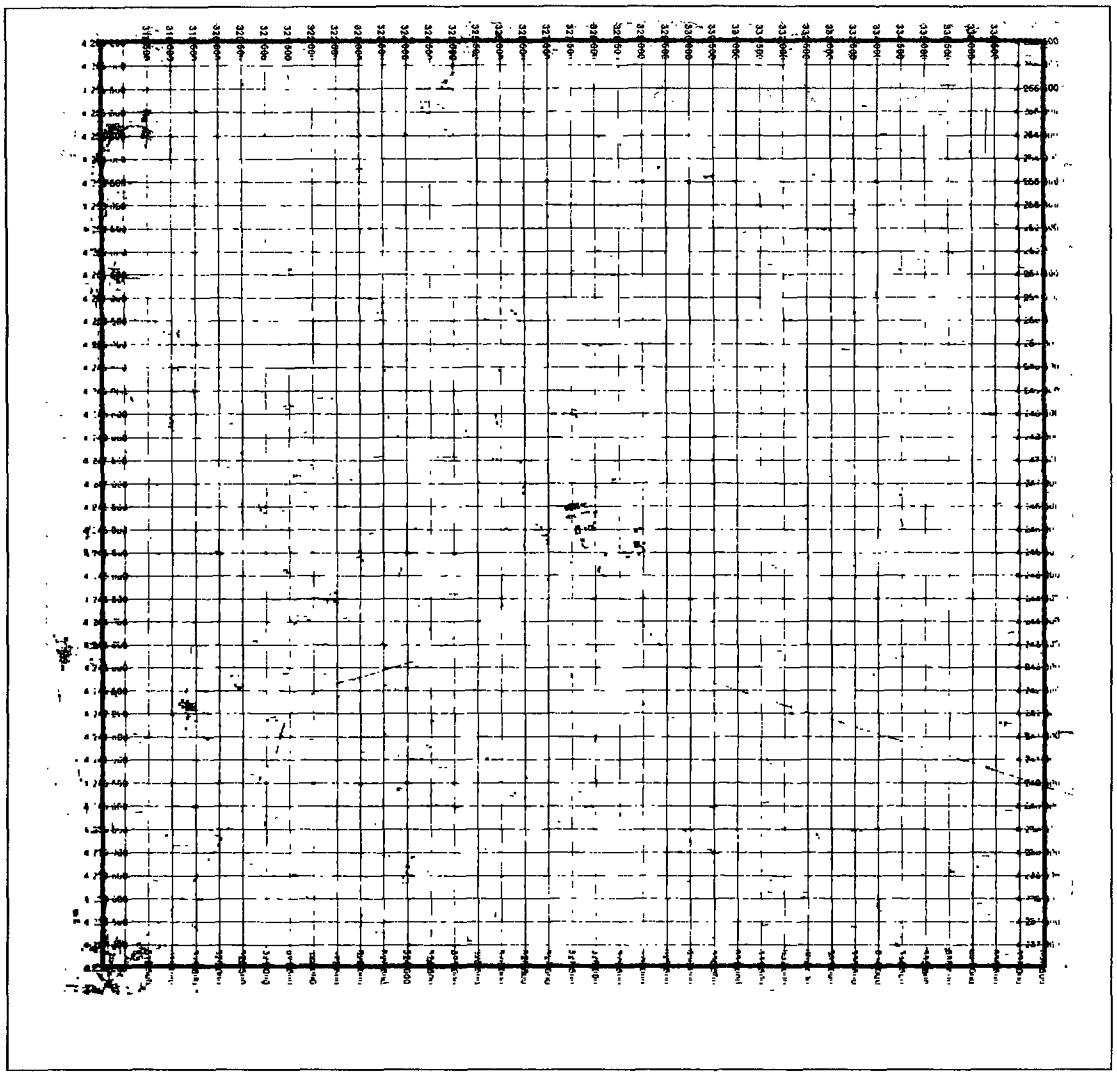


Figure IV.2.5.1. Topographical Map of the Area

Meteorological Data

The ISC Short Term model accepts hourly meteorological data records for wind speed, wind direction, temperature, and stability class, urban and rural mixing layer heights for modeling pollutants. Model uses these data to define the conditions for plume rise, transport and diffusion. The model estimates the concentration value for each source and receptor combination for each hour of input meteorological data.

An Overview of Meteorology of the Region

Meteorology is the basic factor governing the dispersion of air pollutants. Therefore, for the Modelling studies due attention is given for processing of the meteorological data. The State Department of Meteorology (DMİ) operates a measurement station in Afşin, where several meteorological parameters such as ambient temperature, atmospheric pressure, wind speed, wind velocity, relative humidity etc. are recorded on hourly basis. Last three year (2002, 2003 and 2004) meteorological data were obtained from the State

Department of Meteorology and is analyzed to understand the average meteorological conditions in the region. Moreover, the meteorological data for the year 2004 was found to represent the general characteristic meteorological conditions in the region. In addition, the model run for 3 years, 2004 year run also applied for existing case and base case situations.

The meteorological data was processed by PCRAMMET, which is suggested by EPA to be used as a meteorological pre-processor with ISCST, was used for preparation of the meteorological input data. PCRAMMET was used in order to identify hourly atmospheric stability constants and the mixing layer heights to be used in ISCST3.

Receptors

The study area selected is shown in Figure IV.2.5.1 with the dimensions of 20 km x 20 km, in which AEATPP is located at the centre. The reason for selection is to cover the closest residential areas that are in the scope of the project and to be able to observe the ground level concentration distribution of pollutants at the selected area clearly.

The local terrain is simple along with a flat land of totally 1681 (41 x 41) receptor points; each is 500 meters apart from each other.

Summary of Emission Concentrations for the Modelling

For the existing situation, the plant is not operating properly and the stack gas emissions are high with respect to the measurement data. Based on the input data, the stack gas concentrations for the existing situation, base scenario and the alternatives are given in the Table IV.2.5.4. It can be seen from the table that both for the existing case and the base case, SO_2 emission concentration exceeds limit value given in Turkish Regulation. In case of dust emission, the limit value is exceeded only at the base case. In the baseline scenario, the dust emission will be reduced to the limit value. After installation of FGD unit the emission concentration will be lower than the Turkish Regulation.

Table IV.2.5.4. Overview of Concentration of the Existing Situation, the Alternatives and the Regulation

Parameter	Existing Situation (mg/m^3)	Base Scenario (mg/m^3)	Alternative 1 With FGD (mg/m^3)	Alternative 2 With FGD (mg/m^3)	Turkish Regulation (mg/m^3)
SO_2					1000
Main stack	7697	4357	-	-	
Bruden stack (each)	1157.4	4286	-	-	
Cooling tower	-	-	1000	1000	
NO_x					800
Main stack	480	464.3	-	-	
Bruden stack (each)	226.9	471	-	-	
Cooling tower	-	-	470	470	
PM_{10}					100
Main stack	2099	100	-	-	
Bruden stack (each)	2314.8	100	-	-	
Cooling tower	-	-	100	50	

The contribution of the emissions to the local background concentration was calculated. For all scenarios, the emissions of power plant B have been incorporated in the calculations. For plant B the emissions per unit are:

SO_2	185 g/s
NO_x	121 g/s
Dust	6.6 g/s
Operating time	6500 h/yr

MODELLING RESULTS

After preparing the emission inventory, the dispersions of pollutants are studied by using the USEPA's Industrial Source Complex Short Term Model Version 3 (ISCST3). The following features of ISCST3 are used for air dispersion modeling purposes;

- Rural dispersion on an elevated terrain is considered,
- Effects of stack-tip downwash are considered,
- Buoyancy-induced dispersion is included,
- No dry/wet deposition or depletion (removal) of particulate or gaseous mass from the plume is considered,
- Default wind profile exponents and default vertical potential temperature gradients are used,
- No exponential decay of gaseous pollutants is considered.

Based on the results of modeling calculations, the ground level pollution concentration distributions for SO_2, NO_X and PM are prepared and superimposed on the map of the study area (given in Appendix B.13). This gives a clear picture of the ground level concentrations of the pollutants concerned.

All sources from AEATPP and AEBTPP are included in dispersion modeling study. The model is run considering two averaging periods. For the first case, the years between 2002 and 2004 are considered and the dispersion of pollutants within this time period is examined for existing situation, base scenario, alternative 1 with FGD and alternative 2 with FGD.

As another case, the meteorological input data prepared for the year 2004 is used and the dispersion of pollutants is obtained for the existing situation and base scenario.

The 24 hour average daily maximum concentrations for years 2002-2004 and % of exceedances of the Turkish Regulation value of 400 $\mu g/m^3$ is tabulated in Table IV.2.5.11.

Calculation of Exceedances of Short Term Turkish Air Quality Limit Values:

Number of Receptor Points: 41 x 41 = 1681

Numbers of Days, Daily Averages are calculated: 365 days for the year 2004
365 x 3 for three years run
(2002- 2004)

=1095 days

Total Number of Daily Average Data Calculated for all Receptor Points:

1681 x 1095 = 1,840,695 data points for 3 years run

1681 x 365 = 613,565 data points for only one run

Calculation of Percent Exceedances:

$$\frac{\text{Number of Data Exceeding 400 } \mu g/m^3 \text{ (Turkish Short Term Air Quality Limit Value for } SO_2)}{\text{Total Number of Daily Average Data Calculated for all Receptor Points}} \times 100$$

For Example;

For existing situation for the year 2002-2004 number of exceedances for daily average limit value (400 µg/m^3) are 27,377 out of 1,840,695 data points. The percentile of exceedences in this case is:

((27,377)/(1,840,695)) x 100 = 1.49%

Table IV.2.5.5. Air Quality Characteristics at the Ground Level Daily Maximum in Afşin-Elbistan Area with Meteorological data of 2002-2004

Parameter	Turkish Standard	Existing Situation	Base Scenario	Alternative 1 With FGD	Alternative 2 With FGD
SO_2	% Exceedence of 400 µg/Nm^3 (Turkish Standard is ≤ 5 %)	1.49	3.24	0.012	0.012
NO_x	% Exceedence of 300 µg/Nm^3 (Turkish Standard is ≤ 5%)	0	0.007	0.0004	0.0004
PM_{10}	% Exceedence 300 µg/Nm^3 (Turkish Standard is ≤ 5%)	1.71	0	0	0

The annual average and highest 24 hours average ground level concentrations of the above-mentioned pollutants due to all sources are modeled with ISCST3. The outputs of the model and the results for dispersion modeling calculations are given in Annex B.13.

Modeling results show that, for SO_2, for all scenarios none exceed the Turkish short term limit, which is defined in the Turkish Regulation that 95% of the all results should be less than 400 µg/m^3.

For NOx, none of annual average values exceed long term limit values stated in the Turkish Regulation. For all cases, there is compliance with Turkish short term limit, which is defined in the Turkish regulation that 95% of the all results should be less than 300 µg/m^3.

For PM_{10}, in all scenarios, there is compliance with Turkish short term limit, which is defined in the Turkish regulation that 95% of the all results should be less than 300 µg/m^3.

Average annual air quality characteristics in Afşin-Elbistan area (for residential areas) with meteorological data of 2002-2004 are tabulated in Table IV.2.5.6.

Table IV.2.5.6. Average Annual Air Quality Characteristics in Afşin-Elbistan Area (for residential areas) with Meteorological data of 2002-2004 (Concentrations are in µg/m³)

Scenerio	Parameter	Çogulhan	Alemdar	Kalaycık	Kışlaköy	Tanır	Bakraç	Büget	Yazibelen	Afşin	Karagöz	Kuşkayası	Tepebaşı	Turkish LT Regulation
Existing Situation	SO_2	10	40	130	10	15	0	14	13	7	6	17	10	150
	NOx	2	7	12	2	2	1	1	2	1.5	1	2	2	100
	PM	20	60	70	15	20	10	5	20	15	5	20	15	150
Base Scenario	SO_2	60	130	140	30	40	20	10	55	30	17	55	30	150
	NOx	6	18	2	3	4	2	1	6	3.5	2	6	4	100
	PM	1.5	4	6.5	1	1	0.5	1.5	1.2	1	0	1.5	1	150
Alternative 1 With FGD	SO_2	4	3	30	2	2	2.5	2	5	2.5	2	7	4	150
	NOx	2	2	17	1.2	1	1.5	1	2.5	1.3	1.2	1.8	2	100
	PM	0.3	0.25	3	0.2	0.25	0.1	0.23	0.5	0.25	0.2	0.7	0.4	150
Alternative 2 With FGD	SO_2	4	3	30	2	2	2.5	2	5	2.5	2	7	4	150
	NOx	2	2	17	1.2	1	1.5	1	2.5	1.3	1.2	1.8	2	100
	PM	0.15	0.125	0.15	0.1	0.125	0.05	0.135	0.25	0.13	0.1	0.35	0.2	150

Short term air quality characteristics in Afşin-Elbistan area (for residential areas) with meteorological data of 2002-2004 (% exceedence of 400 µg/m³) are tabulated in Table IV.2.5.7.

Table IV.2.5.7. Short Term Air Quality Characteristics in Afşin-Elbistan Area (for residential areas) with Meteorological data of 2002-2004 (% Exceedence of 400 μg/m³)

Scenerio	Parameter	Çogulhan	Alemdar	Kalaycık	Kışlaköy	Tanır	Bakraç	Büget	Yazıbelen	Afşin	Karagöz	Kuşkayası	Tepebaşı	Turkish ST Regulation
Existing Situation	SO_2	0.02	0.21	2.72	0	0	0	0	0	0	0	0	0	5
	NOx	0	0	0	0	0	0	0	0	0	0	0	0	5
	PM	0.11	2.28	1.62	0	0	0	0	0	0	0	0	0	5
Base Scenario	SO_2	0.68	3.77	3.72	0.48	0.37	0.09	0	0.27	0.07	0	0	0.18	5
	NOx	0	0.02	0.02	0	0	0	0	0	0	0	0	0	5
	PM	0	0	0	0	0	0	0	0	0	0	0	0	5
Alternative 1 With FGD	SO_2	0	0	0.07	0	0	0	0	0	0	0	0	0	5
	NOx	0	0	0	0	0	0	0	0	0	0	0	0	5
	PM	0	0	0	0	0	0	0	0	0	0	0	0	5
Alternative 2 With FGD	SO_2	0	0	0.07	0	0	0	0	0	0	0	0	0	5
	NOx	0	0	0	0	0	0	0	0	0	0	0	0	5
	PM	0	0	0	0	0	0	0	0	0	0	0	0	5

For existing case, base scenario and the alternatives with FGD, average annual and short term (daily) air quality characteristics in Afşin-Elbistan area for residential centers are in compliance with the long term and short term air quality limits as indicated in Table IV.2.5.6 and Table IV.2.5.7.

In Table IV.2.5.8, average air quality characteristics of the overall impact area under base scenario are given. According to Table IV.2.5.8, annual average air quality characteristics for the region is determined to be in compliance with the Turkish Regulation.

Table IV.2.5.8. The Average Air Quality Characteristics of Afsin-Elbistan Region Under The Base Scenario (World Bank Project)

			Turkish Standard (µg/Nm³)	
Air Quality Parameter	**Annual Average (µg/Nm³)**	**Percent of Year Maximum Allowable Daily Concentration is Exceeded (%)**	**Annual Average Limit Value (µg/Nm³)**	**Percent of Year Maximum Allowable Daily Concentration is Exceeded (%)**
Sulfur dioxide (SO_2)	53.06	3.24	150	5
Nitrogen oxides (NO_x)	6.42	0.007	100	5
(PM_{10})	1.94	0	150	5

During the operation period of the project, ground level concentrations of the emissions from the power plant will be in compliance with the short term and long term limits of the Regulation on Air Quality Protection. The only exceedance is the annual average SO_2 ambient concentration at the point of the ground level maximum (GL_{max}). However, this point is on a remote hillside area far removed from any population center or area of ecological significance. At all sensitive receptors, and on an area –wide average basis, there are no exceedences of Turkish long term and short term air quality standards for SO_2.

According to Article (j) of Regulation on Industrial Air Pollution Control, "if the limit values of RAQP are exceeded in the region where the plant is located, the emergency plan prepared by the Governorship will be complied".

IV.2.6.The Quantity and Characteristics of the Ash and the Gypsum to Be Formed during Operation of the Plant, Ash Melting Points, Storage/Piling, Disposal, Their Impacts on Receiving Environment, Possible and Remaining Impacts, Mitigation Measures

Ash produced by combustion has been carried by ash transportation system. Ash is first removed by the ESPs and then it is conveyed to mining area by ash conveyors and buried here by filling the empty area caused by the coal extraction.

Specific weight of the Afşin-Elbistan ash is 2.72 g/cm^3 and grading is 2704 cm^2/g. Chemical analysis of flying ash of Afşin-Elbistan is given by the Table IV.2.6.1 and Table IV.2.6.2.

Table IV.2.6.1. Chemical Analysis of Flying Ash of Afşin-Elbistan

Oxide (%)	Sample1	Sample2	Sample 3	Sample 4	Sample 5	Average	Standard Deviation	Variation Coefficient (%)
SiO_2	21.63	16.32	18.25	11.82	17.48	17.1	3.55	20.77
Al_2O_3	11.72	8.02	9.58	6.08	9.37	8.96	2.08	23.19
Fe_2O_3	4.65	3.78	3.82	2.7	4.3	3.85	0.74	19.13
S+A+F	38	28.12	31.65	20.6	31.15	29		
CaO	41.33	50.02	49.05	60.75	44.72	49.17	7.35	14.95
MgO	1.83	1.7	1.79	1.59	1.74	1.73	0.09	5.34
SO_3	14.4	15.3	13.6	12	18.6	14.78	2.46	16.62
K_2O	0.58	0.41	0.46	0.31	0.43	0.44	0.1	22.22
Na_2O	0.22	0.2	0.2	0.17	0.2	0.2	0.02	9.03
K.K.	2.82	3.92	2.98	4.13	2.67	3.3	0.67	20.32

Source: Tokyay, M., Erdoğdu, K., 1998, Türkiye Termik Santralarından Elde Edilen Uçucu Küllerin Karakterizasyonu, Türkiye Çimento Müstahsilleri Birliği Yayını, Ankara.

Table IV.2.6.2. Characteristics of Ashes from Combustion

	(Unit4 18.01.90) %	(Unit 1 slag 18.01.90) %
SiO_2	30.78	39.59
R_2O_3	21.22	25.85
Fe_2O_3	10.81	7.41
Al_2O_3	10.41	18.44
CaO	32.59	22.92
MgO	4.06	3.06
Na_2O	0.49	0.51
K_2O	0.52	0.58
SO_3	12.23	4.75
Combustion loss	0.27	5.85

Source:TEK İşletme ve Bakım Dairesi Başkanlığı Santrallar İşletme ve Bakım Müdürlüğü Laboratuvarlar Şefliği

Comparison of chemical composition of Afşin Elbistan fly ash with standards is given below.

Table IV.2.6.3. Comparison of Chemical Composition of Afşin Elbistan Fly Ash with Standards

Oxide (%)	AE Fly ash	TS 639	ASTM C618	EN 450	ENV-197-1	
					V	W
SiO_2	17.1					
Al_2O_3	8.96					
Fe_2O_3	3.85					
S+F+A	29.9	>70	>50			
CaO	49.17					
Free CaO				<1		
Reactive CaO	-39				<5	>5
Reactive SiO_2	-11.5			>25	>25	>25
Cl				<1		
MgO	1.73	<5				
SO_3	14.78	<5	<5	<3		
K_2O	0.44					
Na_2O	0.2					
K.K.	3.3	<10	<6	<5	<5	<5

Source: Tokyay, M., Erdoğdu, K., 1998, Türkiye Termik Santralarından Elde Edilen Uçucu Küllerin Karakterizasyonu, Türkiye Çimento Müstahsilleri Birliği Yayını, Ankara.

The ashes of AEATPP was analyzed according to parameters of Regulation on Hazardous Waste Control Annex 11-A and it is shown that the ashes are not hazardous wastes.

The gypsum from FGD unit at the second phase of the project will be mixed with ash and then the mixture will be conveyed for the disposal at mining area. Amount of gypsum, ash and slag produced will be about 5.750 millions ton per year. The water amount in the gypsum will supply the moisture needs of the mixture to be conveyed. The disposal of the mixture will be same as the method state above. Reuse of the gypsum is not possible in this region. Ash and gypsum mixture will be disposed at mining area. To prevent spreading, water will be applied on gypsum and ashes.

The ashes of AEATPP was analyzed according to parameters of Regulation on Hazardous Waste Control Annex 11-A and the results are presented in the report of Project of Middle East Technical University on Thermal Power Plants Ashes of TEAŞ (Project Code No: 98.03.11.28) and Table IV.2.6.4. The results were compared with the Regulation on Hazardous Waste Control Annex 11-A and all parameters between the limit values and or in the defined range, therefore the ashes can be landfilled.

Table IV.2.6.4. Analysis Results of Ash Samples from Thermal Power Plants of EÜAŞ

Parameter	Sample I
	Afşin-Elbistan
PH	11.50
TOC, mg/L	3.904
As, mg/L	0.8168
Pb, mg/L	<0.001
Cd, mg/L	<0.02
Cr (VI), mg/L	0.11
Cu, mg/L	<0.05
Ni, mg/L	<0.01
Hg, mg/L	0.027
Zn, mg/L	0.0122
Fenol, mg/L	<0.001
F^-, mg/L	1.8
Ammonium, mg/L	0.6104
Cl^-, mg/L	3.9
CN^-, mg/L	<0.08
Sulfur, mg/L	0.066
Nitrite, mg/L	0.0526
Halogenous Organics (AOX) (mg/l)	0.01028
Thinners and solvents (Cl/l)	None
Pesticides (μg Cl/l)	None
Soluble Matters in the Oil (mg/l)	<0.1

Source: TEAŞ-Termik Santral Küllerinini Tehlikeli Atıklar Yönetmeliği Hükümlerine Göre Depolanabilırliğinin Araştırılması Projesi, ODTÜ, 1999

Impacts on groundwater at mining site where the mixture of ash, slag and gypsum is disposed are stated at Section IV.2.12.

The cover of the disposal site will be afforested as current condition. The afforestation is shown by the pictures below.

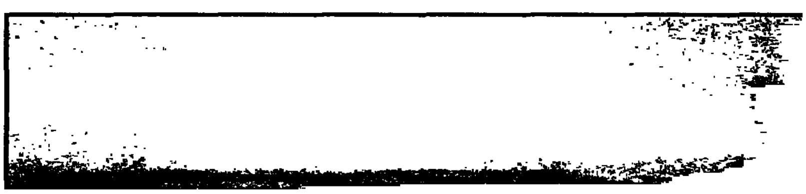


Figure IV.2.6.1. Afforestation Site

Figure IV.2.6.2. Afforestation Site

IV.2.7. Quantity and Characteristics of Other Solid Waste that Will Be Generated during Operation of the Plant, Storage/Pilling, Disposal Operations

Quantity and disposal of ash, slag and gypsum produced during the operation period of the power plant and the FGD are stated in section above (Section IV.2.6). Sludge from treatment plant will be disposed in compliance with Regulation on Solid Wastes and 31.05.2005 dated Regulation on Soil Pollution Control.

Domestic solid wastes will also be produced during the operation period of the AEATPP. Existing domestic solid waste production of the power plant is 146,000 kg/year. Solid wastes are collected by a private firm and disposed. After rehabilitation and construction of FGD, same procedure will continue, there will not be any change in amount of solid waste and disposal method.

During operation of the plant, according to Regulation on Solid Waste Control, domestic solid wastes produced during the operation phase of the project, the wastes will be separated for the collection, transportation and disposal of the wastes.

According to Regulation on Hazardous Waste Control, hazardous wastes produced during the operation phase of the project will be taken by the licensed vehicles and disposed at licensed disposal plant.

The issues related with solid wastes and other wastes are stated at EMP given by Annex A1.

IV.2.8. Vibration and Noise Sources and Their Levels, Impacts and Proposed Measures during Operation Period

Noise originates from workplace sites with high-powered equipment such as the steam turbine, generator, and substations. The noise from these sources may exceed 85 decibel acoustic (dBA) in the production area. The personnel working these places should use ear protection equipment. The impact of noise will be negligible beyond 500 m from the generation site.

Under the normal operation conditions, the sound pressure level will not exceed 65 dBA in the border of the power plant. The daytime and the night time limit values for industry noise levels stated by Regulation on Assessment and Management of Environmental Noise that are 68 dBA and 58 dBA (industry and settlement are together, dominant is industry) respectively will be complied.

Table IV.2.8.1. Environmental Noise Limit Values

Areas	L_{day} (dBA)	L_{night} (dBA)
Industrial areas (industrial areas)	70	60
Areas where industry and settlement are together (mostly industry)	68	58
Areas where industry and settlement are together (mostly settlement)	65	55
Rural areas	60	50

The World Bank standard allows 70 dB (A) for industrial zones at all times.

Table IV.2.8.2 World Bank Standard for Noise

Receptor	Maximum Allowable log Equivalent (hourly measurement in dBA)	
	Daytime (07.00-22.00)	Night time (22.00-7.00)
Residential, institutional, educational,	55	45
industrial, commercial	70	70

dBA=decibel acoustic
Source: World Bank Handbook for Pollution and Control

IV.2.9. Possible Impacts on Terrestrial Flora/Fauna and Mitigation Measures

IV.2.9.1. Impacts on terrestrial flora

As a result of the rehabilitation project, the settleable dust emissions from the Afşin-Elbistan A Thermal Power Plant (AEATPP) will decrease below the limit values of Regulation on Industrial Air Pollution Control. This will have a positive impact on the terrestrial flora of project impact area.

IV.2.9.2. Impacts on terrestrial fauna

The project impact area does not constitute a special living and breeding habitat for the fauna species. Planned project will be realized in the existing power plant area; therefore there will not be any habitat loss for the fauna species. By the rehabilitation of power plant and construction of FGD unit, the ambient air quality will increase and that will have a positive impact on terrestrial fauna indirectly.

IV.2.10.Soil Acidification, Methods Used for Determination of Soil Acidification and Mitigation Measures

AEATPP is located in Afşin District of Kahramanmaraş Province that is included in Mediterranean Region. However, because of the location, climatological properties of Middle Anatolia is observed. Therefore, as it is seen by Table IV.2.10.1, pH is between 7-7.9 in the 89% of the soils of Middle Anatolia.

Table IV.2.10.1. Distribution of PH Values in Turkey's Soils (Ülgen et al, 1998)

Region	Number of Analyzed Soils	pH				
		4.0-4.9	5.0-5.9	6.0-6.9	7.0-7.9	8.0-8.9
Trakya and Marmara	8462	0.9	10.2	30.7	57.1	1.1
Black Sea	10095	4.7	16.2	25.4	51.8	1.9
Middle Anatolia	25778	-	0.7	4.2	89.7	5.4
Southern Anatolia	4272	-	-		93.3	2.2
Eastern Anatolia	1342	-	0.3		85.6	6.7
Aegean	7404	-	2.7		66.7	7.9
Lakes	3871	-	0.6		84.2	8.2
Mediterranean	3367	-	-		85.9	8.6
Total	64591					
Turkey Average		0.9	4.5		76.5	4.7

Source: Bitki ve Toprağın Kimyasal Analizleri III: Toprak Analizleri, Ankara Üniversitesi Ziraat Fak. Eğitim, Araştırma ve Geliştirme Vakfı Yayınları No: 3, Prof.Dr. Burhan Kacar

The sensivity of the soils around the power plant have been evaluated by the qualitative approach developed by Holowaychuk and Fessenden (1987). pH, cation exchange capacity, basic saturation percentage, $CaCO_3$ percentage, and total changeable cation amount have been considered in the assessment.

Table IV.2.10.2. Criteria for Acidification Sensivity of Soils (Holowaychuk and Fessende, 1987)

Cation Exchange Capacity	pH	Sensivity to Alkaline Cation Loss	Sensivity to Acidification	Sensivity to Al Dissolve	General sensivity
<6	<4.6	H	L	H	H
	4.6-5.0	H	L	H	H
	5.1-5.5	H	M	H	H
	5.6-6.0	H	H	M	H
	6.1-6.5	H	H	L	H
	>6.5	L	L	L	L
6-15	<4.6	H	L	H	H
	4.6-5.0	M	L	H	M
	5.1-5.5	M	L - M	M	M
	5.6-6.0	M	L - M	L- M	M
	>6.0	L	L	L	L
>15	<4.6	H	L	H	H
	4.6-5.0	M	L	H	M
	5.1-5.5	M	L	M	M
	5.6-6.0	L	L- M	L -M	L
	>6.0	L	L	L	L

D: Low Sensivity, O: Middle Sensivity, Y: High Sensivity

General sensitivity classification and baseline soil survey show that soil samples of the project area are not susceptible to soil acidity. Furthermore, sensivity to alkaline cation loss, sensivity to Al dissolve and general sensivity is "L" Category (low sensivity).

In conclusion, project will not have a negative impact on regional soil quality.

IV.2.11. Impacts of the Project on Existing Agricultural Areas and Agricultural Products

Impacts of the fly ash from the power plant on agricultural lands and agricultural products are explained in the Chapter 3, Sections 3.2.3 and 3.2.4. Scientific researches on this subject are also included in that section. In the scope of the rehabilitation project for AEATPP, the electrofilters will be rehabilitated and dust discharge will be limited, therefore the possible negative impacts of dust on the agricultural products of Afşin-Elbistan Plain will decrease by the rehabilitation project.

IV.2.12. Impacts on Groundwater and Surface Water and Mitigation Measures

Both sewage and ash water treatment plant will be in use during the operation of the AEATPP. Therefore there will not be any discharge from the plant to the receiving bodies without treatment. Discharge limits of the current Water Pollution Control Regulation came into force by 31.12.2004 dated and 25687 numbered Official Gazette will be complied.

Cooling water demand of the power plant currently supplied from the Pınarbaşı Pond of Ceyhan River Spring in Elbistan. However, Pınarbaşı Pond, which has been an excursion spot for the public, has been in time got excessive mossy. Excessive moss, point out that there has been eutrophication problem in the pond.

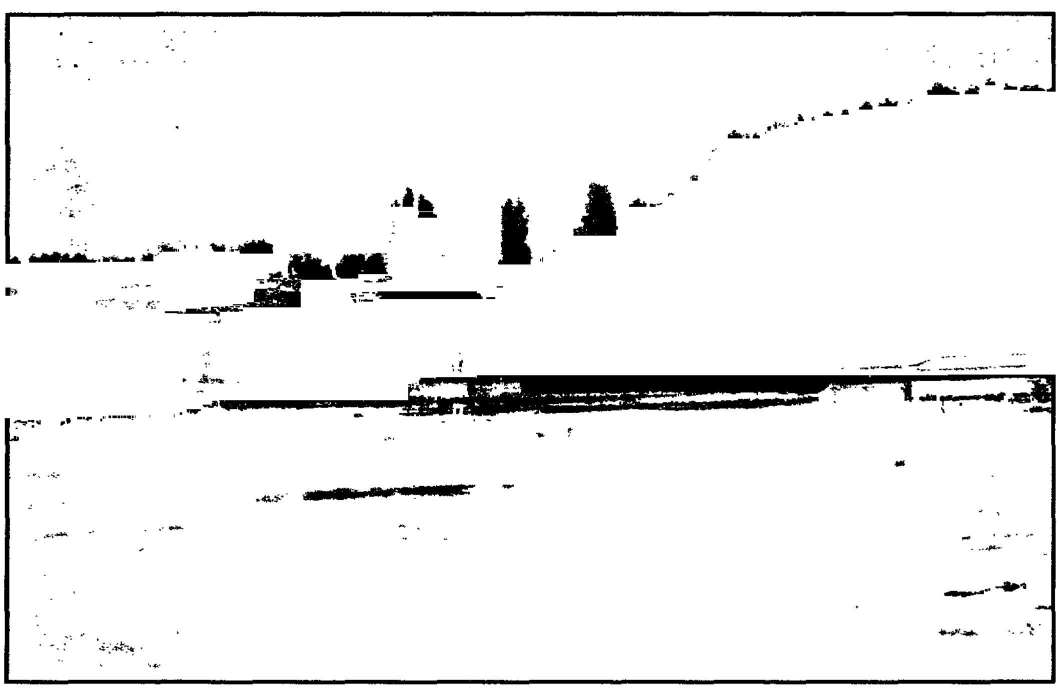


Figure IV.2.12.1. Before Cleaning

In order to cover the moss problem, a project has been established under the name of “Detection of the moss problem in Afşin-Elbistan A Thermal Power Plant Water Source and the Solution Suggestions Project”, which was prepared in 2000 by Chemical Engineering Department of Faculty of Hacettepe University upon the request from TEAŞ General Directorate Environmental Directorate. In this project, in order to detect the moss problem, samples of water, moss and sediments are taken and analyzed in August and September 2000. For the sake of the solution of excessive moss, advantage and disadvantages of the biological, chemical and mechanical contention methods were discussed in this report and mechanical contention method was suggested as the most appropriate contention method.

In the mechanical contention method, the plants accumulated on the water level, and the plants accumulated just beneath the water level should be gathered and transported to the shore. Thus, without disturbing the vision at the bottom of the pond and without causing a long term drought in the pond, the ugly image occurring on the water surface, which preventing the surface flow of water, will be removed completely without exterminating all the plants and living beings. Also, one of the advantages of this method is that, since the amount of organic material and nutriment is reduced with removing such plants, the speed of the eutrophication will be reduced.

In order to attain to this goal, a project has been prepared under the name “Cleaning of the moss on the surface of the Afşin-Elbistan A Thermal Power Plant Water” in 2002 by Chemical Engineering department of Hacettepe University. In this project, in order to realize the mechanical contention method, which was suggested in order to remove the moss, a device called "Yüzer-Biçer" (Floating-Cutter) was designed.

Figure IV.2.12.2. Floating-Cutter Boat

Floating-cutter boat was delivered to General Directorate of EÜAŞ after the test work done in 2002. After the usage, it was realized that "Floating-cutter" boat has satisfactorily maintained the function for what it was designed, so that the desired goal have been attained. The blanket type of moss, which was causing environmental and image pollution and affecting the natural life in the pond in a negative manner by covering the surface of the pond, was gathered satisfactorily from the surface of the pond. As a consequence of regular usage of floating-cutter boat in a periodic manner, the problem corresponding to the pond will be solved. The photographs taken during the operation of the "floating-cutter" boat is shown above.

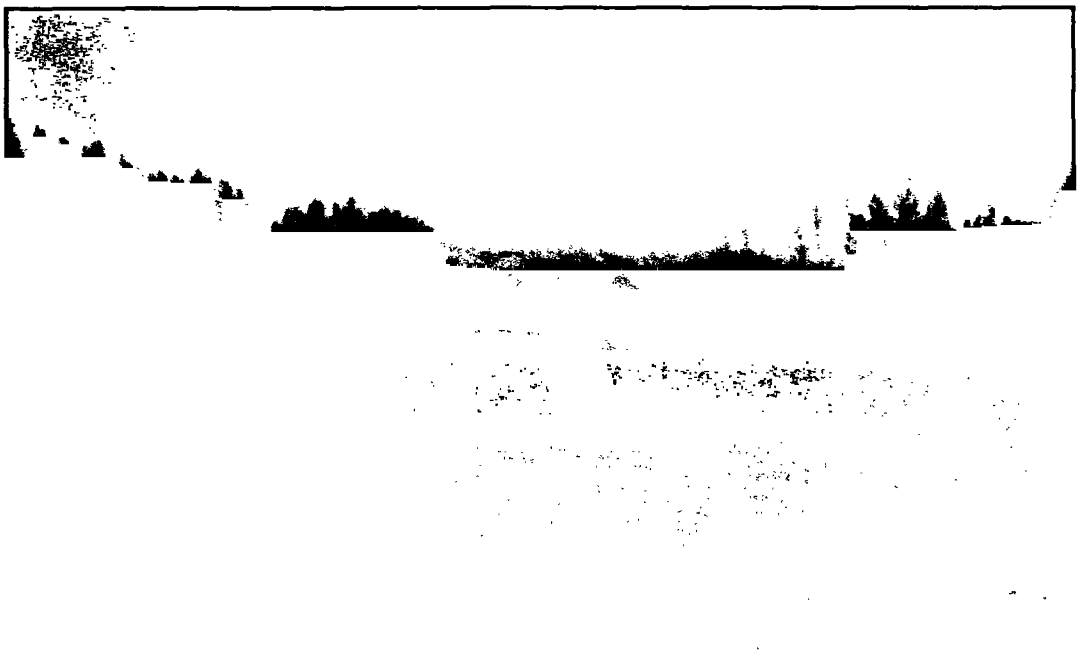


Figure IV.2.12.3. View of the Ceyhan Spring after Cleaning with "Floating-cutter" Equipment

Impacts on Groundwater

At the second stage of the project, the gypsum produced at the FGD unit will be transported by the closed conveyor and disposed by discharging into the mining area where lignite is removed completely. Low solubility of ash and gypsum decreases pollution risk. Dissolution and negative effect on groundwater is not expected. Since the site has basic characteristics, leakage of heavy metals from ash is not expected.

Groundwater around the AEATPP will be monitored during the operation period of the project.

IV.2.13.Traffic Load

During the construction period of the project, the construction vehicles and trucks will have a contribution to baseline traffic flow.

Daily transportation of the both AEATPP and AEBTPP staff has been supplied by the service buses. Transportation will continue to be same after rehabilitation of the plant.

Transportation of the limestone from the quarry to the power plant will also have a small traffic load to the existing traffic load of the region.

IV.2.14. Risky and Hazardous Activities of the Project during Operation Period with respect to Human Health and Environment

The most important risk of the existing plant is existing air pollution resulting from the failure of the ESPs of the power plant and excess SO_2. As it seen in the measurement report, results of stack gas measurements conducted in 2000 show that dust and SO_2 emissions exceeds the limits of Regulation on Air Quality Protection which was in use in year 2000. Therefore EUAS has planned the rehabilitation of AEATPP and FGD retrofit. By this project, risky and hazardous health impacts of existing plant will be minimized. Emissions will be under the limits of the current Regulation on Industrial Air Pollution Control currently in use.

Industrial accidents caused by the carelessness of the personnel may be other risk that is normally seen at all industrial plants. Personnel will be trained on Occupational Health and Safety rules in order to guarantee safety at plant. Traing issue is detailed in the EMP presented by Annex A1.

A view from the existing signs from inside AEATPP is shown below.

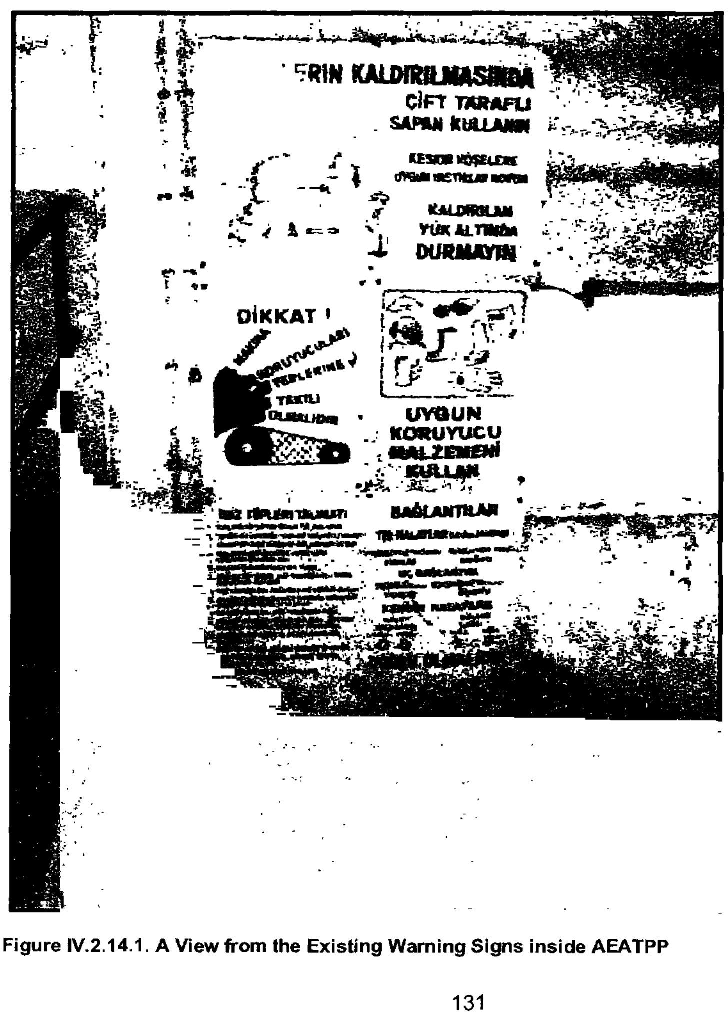


Figure IV.2.14.1. A View from the Existing Warning Signs inside AEATPP

Waste management will properly be applied in the plant. All wastes will be collected and disposed in accordance with Regulation on Water Pollution Control, Regulation on Industrial Air Pollution Control, Regulation on Hazardous Wastes Control and Regulation on Hazardous Chemicals. The requirements of these regulations are presented by Environmental Management Plan stated by Annex A1.

The medical wastes from the medical center of the power plant will be disposed in compliance with Regulation on Medical Wastes came into force by 20.05.1993 dated and 21586 numbered Official Gazette.

Fire fighting system will always be present, tested and in service in the plant.

IV.2.15. Impacts of the Project on Socio-Economic Environment and Environmental Cost Benefit Analysis

Power plants produce electricity supplying the energy needs of the country. Therefore, socio-economic effects of the power plants can be regarded as direct and indirect. Direct impacts are the energy supply and the recruitment at the plant. The indirect impacts are the general increase in the production where the energy is used. The whole usage areas from personnel to the infrastructural services are affected from the electrical energy production. These are the positive impacts of the project during the operation phase.

Local people are affected from the project during both construction and operation phases. Temporary employment will be provided in the region during the construction phase and if required, the additional personnel will be employed at AEATPP.

Environmental impacts of the project during construction are generally short term which is described in the related sections. The most important impacts will occur during the operation, which will give positive impacts on environment. A general environmental cost/benefit analysis is given in Table IV.2.15.1.

As it is stated in the report, the failures caused the decrease in the production of AEATPP. Its production is very low compared to its design capacity. The rehabilitation is inevitable because AEATPP has very important role in the use of the lignite sources in Afşin-Elbistan Region and this power plant is the first power plant of the region. It is estimated that the rehabilitation will decrease the production cost from 1.499 cents/kWh to 0.941 cents/kWh.

Environmental performance of the power plant has also been affected from the failures in the plant. Environmental performance of the power plant decreased because of the ESP failures. PM and SO_2 emissions of the power plant exceed the limit values of Regulation on Industrial Air Pollution Control. By this project, ESPs will be rehabilitated and the efficient dust removal will provide reduction of dust emissions below the limits of regulation. The design efficiency of the electrostatic filters is 99% but the existing efficiency is 96%. Increase in ESP efficiency and low PM emissions crucial part of the rehabilitation.

Second phase of the project includes FGD unit retrofit that will decrease SO_2 emissions in flue gases below the limits of Regulation on Industrial Air Pollution Control that is 1000 mg/Nm^3, and ground level SO_2 concentrations will be below the limits of

Regulation on Air Quality Protection, that are 150 µg/Nm^3 for long term and 400 µg/Nm^3 for short term. The short term limit values are the daily average values that should not be exceeded at 95% of the measured or calculated values.

By this project, the efficiency of the power plant units will increase, amount of lignite required for same amount of energy production (per kWh) will decrease. Therefore, production cost for per kWh will decrease. Lower lignite consumption will provide lower wastes from the power plant.

Local farmers state that there has been decrease and losses in agricultural products because of the particulate matter emissions from the power plant. As the ground level PM concentrations will be lowered by the project, agricultural efficiency will increase. This increase will contribute to positive impacts of the project on the economy.

Electricity will be produced by the less cost by the project and impacts on environment and human health will decrease.

Table IV.2.15.1. Environmental Cost/Benefit Analysis

Assessment Components	**Existing Condition**	**Proposed Project**	**Explanation** **+ : Advantageous compared to other** **- : Disadvantageous compared to other** **x : Same with other**
Air Quality	-	+	There will be positive impacts on regional air quality.
Water Resources	x	x	There will not be change in water sources.
Soil resources	-	+	Emissions will decrease therefore there will be positive impact on soils.
Agricultural Lands	-	+	Emissions will decrease therefore there will be positive impact on soils.
Vegetation Cover	-	+	There will be positive impacts on vegetation cover.
Terrestrial Ecology	-	+	There will be positive impacts on terrestrial ecology.
Aquatic life	x	x	There will not be any change in aquatic life.
Operation expenses	-	+	Operation expenses will increase.
Socio-economy	-	+	The income of the region will increase, social life will be affected.
Environmental Factors	-	+	Short term negative impacts during the construction period, positive impacts during the operation period.

IV.2.16. Other Activities

There is no other issue for this chapter.

CHAPTER V: PROJECT ALTERNATIVES

(Summary of the main alternatives searched by the investor and site selection criteria)

Location

Rehabilitation of the existing power plant (AEATPP) and retrofit of FGD project has no location alternative. Location of the project is the existing plant. The most appropriate areas will be preferred for the location of FGD unit and its buildings.

Technology Alternatives

In almost all FGD systems, SO_2, which is acidic in nature, is removed from the flue gas by reaction with a suitable alkaline substance to produce a solid sulfite or sulfate product. FGD Technologies may be subdivided as wet, semi-dry and dry processes. Further, they may be classified as once-through and regenerable processes. In wet FGD processes, the alkali, usually as slurry, is contacted with the flue gas in a spray tower to form a weak acid solution that reacts with and is neutralized by the dissolved alkali. The sulfite and sulfate salts produced then precipitate out of solution and may be recovered as a saleable product. In dry systems the alkali sorbent is either injected into the gas stream or the gas stream is passed through a bed of the sorbent. SO_2 reacts directly with the solid alkali to form the sulfite or sulfate product. This type of system relies on the sorbent either being very porous and/or finely divided. Semi-dry systems are similar except that water is added to the flue gas to form a liquid film on the sorbent particles in which the SO_2 dissolves, promoting the reaction with the solid. The solid product is collected in the particulate control device for possible sale/disposal. Once-through FGD processes are those such as the wet limestone gypsum (LG) process where the alkali, in this case limestone slurry, removes and neutralizes the SO_2 to form a gypsum product. There is therefore a need for a continuous new sorbent source to sustain the process. Regenerable processes include the Wellman-Lord (WL) process where the reagent used to remove the SO_2 is regenerated in a second stage process and returned to the absorber tower for re-use. There is a wide range of FGD processes commercially available. These include:

- wet processes such as LG, WL, SWW and ammonia scrubbing
- semi-dry processes such as circulating fluidized bed (CFB), spray-dry and duct spray-dry
- dry processes such as furnace sorbent injection and sodium bicarbonate injection.

Choice will depend on technical, economic and commercial considerations. LG systems are well proven, achieve the required removal efficiency, are capable of being retrofitted and competitive in terms of overall lifetime costs.

For the FGD, the planned system is wet-limestone process which is the most preferred system.

Cooling Discharge Alternative

In conventional applications, the flue gas is discharged through stacks while in CTD applications, flue gas is discharged through the cooling towers. The main purpose of CTD technology is to provide a better dispersion than that of conventional stacks. It has been proved by the researches and various practical applications that natural buoyancy of cooling tower plume provides the CTD technology to maintain this purpose. Related studies indicated that the environmental and economical benefits provided by the CTD technology are;

- Provide a better dispersion of air pollutants
- Result in a reasonable decrease in the GLC of pollutants
- Minimize the building downwash problem.

(Oğuz, 1999)

CHAPTER VI: PUBLIC MEETING AND DISCLOSURE

a) Public Notification Methods, Opinion of the People on the Project

Public meeting for the project was held in Çoğulhan Town, which is the nearest settlement to AEATPP, in 17.03.2005. Participants of the meeting were local people, Mayors of Çoğulhan Town, Afşin District, Elbistan District, NGOs from Kahramanmaraş, authorities from A and B Power Plants, media, representatives of Ministry of Environment and Forestry, representatives of Kahramanmaraş Provincial Directorate of Environment and Forestry, representatives from General Directorate of EÜAŞ, and representatives of EIA Consultants, Çınar Engineering and KEMA International B.V. Date of the meeting was determined by Ministry of Environment and Forest. Place of the meeting was determined by Kahramanmaraş Provincial Directorate of Environment and Forestry. There were about 150 participants to the public meeting.

Public meeting was announced to the people by the following methods carried out about ten days before the meeting:

- Meeting was announced in an national newspaper called "Türkiye Gazetesi" on 10 March 2005
- Meeting was announced in the local newspapers published in Afşin and Elbistan Districts and called as "Yeşil Afşin" and "Haber Elbistan" on 10 March 2005.
- Meeting was announced on website of Çınar Engineering (www.cinarmuhendislik.com) during March 2005.
- All corresponding with Afşin, Elbistan Districts Municipalities and the municipalities of the towns of Afşin were completed and announcement was sent to make them announced to the local people
- Kahramanmaraş Provincial Directorate of Environment and Forestry Governorship was contacted to announce all official directorates, NGOs and media,
- An office was rented in Çoğulhan. Local public was informed on the project by this contact point during one month and the opinions of the public were obtained by written complaints. Meeting was also announced from this office.

Newspaper announcements stated above and other corresponding are given by the Annex B7.

Hand brochure were distributed just before the meeting. Project was introduced to people by the presentation prepared by powerpoint program.

People have complaints on the existing emissions from the plant. Their complaints concentrate on the dust. The other subject they mentioned is employment. They wanted recruitment at the both AEATPP and AEBTPP. During the public meeting, local farmers stated that the agricultural products have been affected by the dust emitted from the AEATPP. Farmers of the region interviewed by EIA group experts indicated that there has been a difference in vegetable production compared to before and after commencement of power plant's activity, also, drying of the plants was observed because of the power plant. In addition, most of the complaints were focused on settleable dust problem rather than SO_2. These statements are based on farmers own opinions and observations. However, there is no scientific study or statistical data justifying complaints or observations.

ANNOUNCEMENT

Public meeting will be held for Rehabilitation of existing Afşin-Elbistan A Thermal Power Plant operated by General Directorate of Electricity Generation Corporation and Construction of Flue Gas Desulfurization Unit Project in accordance with 9th Article of EIA Regulation in order to inform people about the project.

This is announced to our public.

Date of the meeting : 17/03/2005
Location of the meeting: Çoğulhan Municipality Club House Çoğulhan Town/Afşin District
Time of the meeting : 10.00

Project Owner:

Electricity Generation Corporation
Tel : +90 (312) 2127861
Fax : +90 (312) 222 82 58

EIA Consultants:

Çınar Engineering Consultancy and Project Services Ltd.

Tel : 0 (312) 472 38 39
Fax : 0 (312) 472 39 33
web : www.cinarmuhendislik.com

KEMA International B.V.
Tel : +31 26 3 56 63 10
Fax: + 31 26 3 89 24 77
web: www.kema.com

SECOND PUBLIC CONSULTATION

The draft EIA report was announced to people and NGOs by making it available at Municipalities of Çoğulhan Town, Afşin and Elbistan Districts, Kahramanmaraş Directorate of Environment, Managements of AEATPP and AEBTPP and the contact office hired in Çoğulhan. Availability of draft EIA report for the examination of people was announced to people by the Municipalities, Kahramanmaraş Directorate of Environment, AEATPP Management, AEABTPP Management and local newspaper. Draft EIA was examined by people for a duration of 15 days from 17 August 2005. Both Turkish and English summary of the EIA Report was also announced to people by web site of Çınar Mühendislik Müşavirlik ve Proje Hizmetleri Ltd.Şti. (www.cinarmuhendislik.com).

The date of the submission of EIA report for people was 15.08.2005. People gave their comments on the draft EIA and their statements at public meeting were included in the EIA Report. A general opinion of the public is the problem by the emissions of the existing power plant. They think that this project will decrease the emissions from the power plant and they give their thanks to EÜAŞ.

Following is the announcement on the local newspaper for the people to make them informed about the Draft EIA Report and to announce that Draft EIA Report was available for the public to review the report.

The documents on the second public consultation are given by the Appendix-B7.

Yeşil Afşin 17 AĞUSTOS 2005

RAK ÖLDÜ
ılan elektrikçi
Belediyesi Fen
Bozkurt (43),
sını gidermeye
Hastanesi'ne
(**)

DİYESİ'NİN
e Meyve Hali'nin
ısı başlattı.
Poyraz, halin iç
larının yeniden
lanacağını ifade
n yoğunluk
bir çok araç
Kahramanmaraş'a
(**)

TESİ
AŞLADI
ksu Haber adıyla
muhabirine
eteye ihtiyaç
için gazete
ımlanan haftalık
(**)

İLAN

Afşin-Elbistan A Termik Santrali Rehabilitasyonu ve Baca Gazı Desülfürizasyonu Ünitesi Tesis Edilmesi Projesi için Çevresel Etki Değerlendirmesi (ÇED) Raporu süreci devam etmektedir. ÇED Raporu, Afşin, Elbistan, Çoğulhan ve Alemdar Belediye Başkanlıkları ile A ve B Termik Santralleri müdürlüklerinde Türkçe ve İngilizce olarak bulunmaktadır.

ÇED Raporu için; gerek sivil toplum kuruluşlarının ve gerekse halkımızdan isteyenlerin raporu inceleyip, görüşlerini aşağıda belirtilen kuruluşlara bildirmelerini bekleriz.

İLETİŞİM BİLGİLERİ:

Faaliyet Sahibi:
Elektrik Üretim A.Ş.
Tel : 0 (312) 2127861 Faks : 0 (312) 2228258

ÇED Raporunu Hazırlayan Kuruluş:
Çınar Mühendislik Müşavirlik ve Proje Hizmetleri Ltd. Şti.

Tel : 0 (312) 472 38 39 Faks: 0 (312) 472 39 33
e-mail: cinar@cinarmuhendislik.com
web : www.cinarmuhendislik.com

KEMA International B.V.
Tel: +31 26 3 56 63 10 Faks: + 31 26 3 89 24 77
Web: www.kema.com

İHALE İLANI

SOME OF THE COMMENTS OF THE PEOPLE ON DRAFT EIA REPORT AND THE PROJECT

The people whose names are listed below agree that they attended to the public meeting held on 17 March 2005 and their opinions and requirements are included in the EIA Report that is prepared after the public meeting.

Muhammet Kılınç
İsmail Çetin
Oğuzhan Yıldız (Worker for Municipality)
Yakup Sarı (Barber of Çoğulhan Town)
Ramazan Kılınç (Farmer)
Hakan Kılınç
Soner Aslan (Farmer)
Aziz Bingöl (Farmer)
Ömer Sönmez
Uğur Berik
Emre Akbulut (Student)
Hacı Veli Kılınç
Durmuş Kılınç (MTA Employee)
Baykal Gözükara (Police)
Selçuk Çoban (University student)

Serdar Koca (Computer Technician)
Mehmet Ekici (Unemployed)
Öner Arslan
Hasan Kılınç
Mustafa Polat (Worker for Municipality)
Recep Yıldız (Municipality Personnel)
Cuma Aslan
Erdal Sümbül (Municipality Personnel)
Mecit Zincirkıra (Municipality Personnel)
Yasin Yılmaz (Municipality Personnel)
Civan Gökhan (Municipality Personnel)
Cuma Ekici (Municipality Personnel)
Rıfat Yıldız (Lawyer)
Mehmet Yıldız
Tamer Yılmaz
Mehmet Biçici
Nevzat Yıldız

Name, Surname: Ertuğrul Şahin
Occupation: Worker at B Plant

First of all, I thank you for you because you are involved such a project. People here inhale this polluted air and nobody made anything for this. I think that nobody will do for that. 90 % of the people here is unemployed. If you can not solve air pollution problem here, please solve recruitment problem and people can make their medical treatment happen.

I again thank you for you such a project.

Yours sincerely.

Name, Surname: Mustafa Biçici
Occupation: Tradesman

I reviewed the EIA Report. I am very happy that it contains the view of the public. It makes me pleased that you share same feelings with us living with the diseases here. I hope you do not discourage our expectations. We would be pleased if you have this ash problem solved for both A and B Plant. We are grateful for you because you are doing such study.

Name, Surname: Mehmet Kılınç
Occupation: University Student

I thank you for you on behalf of Çoğulhan Public because you share this project and this report with Çoğulhan Public.

My age is about the same with the age of the Afşin-Elbistan A Thermal Power Plant. But nobody has shown interest or study for us until now. Even though you can not do anything or they do not put new filters for power plant, your studies on this make us happy. We are happy that there are some studies on this and there are people who consider us. We get used to dust on the fruits and vegetables. But if we get together as Çoğulhan people, we could not express our problems as you did for us. We have many thanks for you our thanks would not be enough because we can not make people informed on our problem as you did.

Figure VI.a.1. General View from Public Meeting

Figure VI.a.2. Presentation of the Project in the Public Meeting

Figure VI.a.3. Speech of a NGO Representative from Elbistan

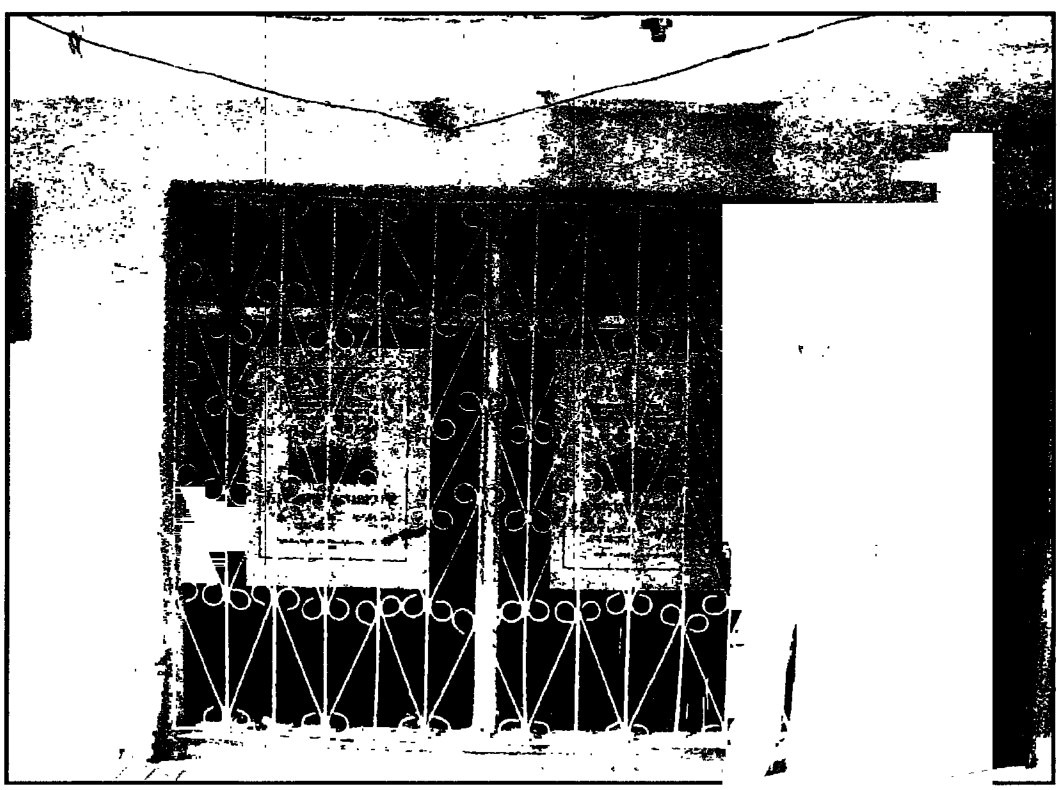


Figure VI.a.4. Disclosure Office in Çoğulhan

b) Non-technical Summary of the Project

Main goals of the project are to improve reliability and efficiency of the AEATPP and extend life of the plant and to decrease emissions of the plant below the limits of Industrial Air Pollution Control Regulation. Therefore the project itself aims at decreasing the negative impacts on the environment.

Environmental baseline studies have been conducting around the region of AEATPP in order to determine environmental baseline of the project area. In the scope of these studies air quality, groundwater and surface water quality, soil quality and noise level will be determined and the results are included in EIA Report.

Emissions of AEATPP will be in compliance with the Regulation on Industrial Air Pollution Control by the rehabilitation of the power plant and addition of the FGD Unit.

FGD unit that will be established as retrofit will be similar to FGD unit in the AEBTPP, and based on wet limestone process.

The results of the modelling show that, in the existing situation, ground level concentration of SO_2 does not exceed the short term limits of Turkish Regulation. After the FGD and the ESP installation, the scenarios show lower concentration values.

Rehabilitation of AEATPP and addition and operation of FGD unit will guarantee reliability and efficiency of the plant, it will also extend the life of the plant and it will increase environmental performance of the plant that is one of the most important power plants of Turkey.

CHAPTER VII: CONCLUSIONS

Afşin-Elbistan A Thermal Power Plant Rehabilitation Project is rehabilitation of the plant and in this scope renewal of the some part of the units and construction of FGD plant will provide extension of life of the plant, increase in efficiency and decrease in emissions from the plant.

Rehabilitation of Afşin-Elbistan A Thermal Power Plant will include maintenance, rehabilitation and modernization of the some parts of the units, mainly boiler, turbine and electrostatic precipitators.

The EIA procedure yielded the following major conclusions:

- The rehabilitation of the ESPs on the main stack and the Bruden stacks is essential to address the dust and particulate emission problems.
- According to the air quality modeling studies, the AEAPP operating at full load after rehabilitation/upgrade without an FGD unit will meet both the long-term and short-term *air quality standards* for SO_2.
- The AEAPP operating at full load will not meet Turkish SO_2 *emission* standards. (However, in evaluating the EIA, the Ministry of Environment and Forestry (MOEF) has recognized that plant performance after rehabilitation does not affect compliance with Turkish air quality standards for SO_2 in the plant vicinity and therefore, has confirmed that it will provide a derogation period in which to install an FGD in accordance with an Amendment to the "Regulation on Control of Air Pollution Caused by Industrial Sources" (RCAP) to be issued shortly.
- The rehabilitation of the plant will improve the plant's environmental compliance with Turkish dust emission standards. Dust emission has been identified, during public consultations as a major environmental issue among local groups.

Following measures will be taken during the construction works to minimize the negative environmental impacts.

If any excavation is applied during the project, it will be stored in the project site and then used for the filling and leveling works, remaining amount will be utilized for landscape studies.

Technical and administrative units of the power plant will be utilized used for the accommodation or any needs of the employees as far as possible. Wastewater from the personnel will be given to the existing domestic wastewater treatment plant of the power plant.

Domestic solid wastes and the construction wastes will be collected at closed containers and taken by the private firm to discharge these waste.

In order to minimize dust formation during the construction period, measures will be taken such as watering and filling and unloading without scattering, covering during the transportation of the material and keeping the upper material with 10% moisture.

Regulation on Noise Control published in 11.12.1986 dated and 19308 numbered Official Gazette will be complied. In addition, maintenance of the machines will be provided regularly in order to keep the noise level low.

In order to decrease emissions from the vehicles used during operation period, routine controls of the vehicles will be done regularly. The vehicles requiring the maintenance will be maintained and the other vehicles will be used instead of that.

Air quality dispersion modelling has been applied for AEATPP. In the scope of the modelling, following scenarios has been evaluated.

- Existing situation
- Baseline scenario with the most likely to happen environmental control options (e.g., ESP limiting particulates to 100 mg/Nm^3 and no FGD)
- ESP limiting particulates to 100 mg/Nm^3 and FGD complying with Turkey's environmental standards
- ESP limiting particulates to 50 mg/Nm^3 with FGD

The results of the modelling show that, in the existing situation, concentration of SO_2 does not exceed the short term air quality limits of Turkey. After the FGD and the ESP retrofit, the scenarios show that concentrations are lower.

Domestic and industrial wastewater will be discharged in compliance with "Regulation on Water Pollution Control".

Domestic solid wastes and solid wastes from the process will be disposed in compliance with "Regulation on Solid Waste Control" and "Regulation on Hazardous Waste Control".

Caps, earlaps, or earplugs will be given to workers in compliance with the Work Law numbered 4857 if the recommended noise levels are exceeded or if the technical means are insufficient to decrease noise and vibrations.

The project will decrease the emissions below the limits of "Regulation on Industrial Air Pollution Control" and therefore negative impacts on environment will decrease.

ANNEXES

ANNEX A:

A.1. ENVIRONMENTAL MANAGEMENT PLAN

Glossary

AEATPP	Afşin-Elbistan A Thermal Power Plant
EIA	Environmental Impact Assessment
EM	Environmental Management
EMP	Environmental Management Plan
EO	Environmental Officer
ERP	Emergency Response Plan
ESP	Electrostatic Precipitator
EÜAŞ	Electricity Generation Corporation Inc.
FGD	Flue Gas Desulfurization
GLC	Ground Level Concentration
HS	Health and Safety
HSE	Health, Safety and Environment
Q	Quarter
RAQP	Regulation on Air Quality Protection
RIAPC	Regulation on Industrial Air Pollution Control
RSWC	Regulation on Solid Waste Control
RWPC	Regulation on Water Pollution Control
YTL	New Turkish Lira

INTRODUCTION

Environmental Management Plan (EMP) has been prepared in the scope of Afşin-Elbistan A Thermal Power Plant Rehabilitation and Construction of FGD Plant EIA Report. EMP establishes a framework for the identification of environmental protection, mitigation, monitoring measures to be taken during both construction and operation of the AEATPP.

Environmental Management Plan (EMP) will:

- provide evidence of practical and achievable plans for the management of the project to ensure that environmental requirements are complied with, by providing an integrated planning framework for comprehensive monitoring and control of construction and operational impacts;
- provide implementation schedule for the measures that must be carried out
- provide specific descriptions of the institutional improvement

Environmental Policies and Standards

Introduction

Environmental management issues are governed or guided by a number of 'standards', including:

those contained in Turkish legislation;

those specified in international standards and guidelines;

Turkish Standards

The principal Turkish environmental legislation is the Environment Law (1983). The principal regulations associated with the Environment Law and which are relevant to the Project are listed below:

Environmental Impact Assessment Regulation dated 16th of December 2003,
Regulation on Soil Pollution dated 10th of December 2001,
Regulation on Control of Solid Wastes dated 14th of March 1991,
Regulation on Control of Hazardous Wastes dated 14th of March 2005.
Regulation on Water Pollution Control dated 31st of December 2004,
Regulation on Industrial Air Pollution Control dated 7th of October 2004,
Regulation on Noise Control Regulation dated 11th of December 1986,
Regulation on Preservation of Air Quality dated 2nd of November 1986,
Regulation on Control of Excavation Soil, Construction and Ruin Wastes dated 18th of March 2004,
Regulation on Control of Waste Oil dated 21st of January 2004,
Regulation on Work Health and Safety dated 9th December 2003, and
Regulation on Control of Excavation Soil, Construction and Ruin Wastes dated 18th of March 2004,

During construction and operation phases of the project, all regulations associated with Turkish Environment Law and stated in EIA Report will be complied with.

International Standards

All aspects of the Project will be undertaken in accordance with World Bank Legislation beside Turkish Laws and Regulations. EMP consists of mainly seven chapters;

- Chapter I, Project Description
- Chapter II, Mitigation Plan
- Chapter III, Monitoring Plan
- Chapter IV, Institutional Strengthening
- Chapter V, Schedule
- Chapter VI, Institutional Arrangements
- Chapter VII, Public Consultation

CHAPTER I- PROJECT DESCRIPTION

Afşin-Elbistan A Thermal Power Plant (AEATPP), located between Çoğulhan and Alemdar Towns of Afşin District of Kahramanmaraş Province and established by TEK during 1984-1987. AEATPP has already got 1355 MWe power due to its four units. It is one of the most important thermal power plants in our country. There have been a loss/decrease in capacity and reliability of the plant due to the fact wears and some great failures have occurred. Average efficiency has decreased below the design efficiency. Therefore, General Directorate of Electricity Generation Corporation (EUAŞ) decided that the rehabilitation and modernization of the plant is required for the prevention of the generation losses.

Afşin-Elbistan A Thermal Power Plant Rehabilitation Project includes rehabilitation of the plant with electrostatic precipitators and construction of Flue Gas Desulphurization (FGD) plant after that.

Rehabilitation of Afşin-Elbistan A Thermal Power Plant will include maintenance, rehabilitation and modernization of the some parts of the units, mainly boiler, turbine and electrostatic precipitators.

FGD unit that will be established as retrofit will be similar to FGD unit in the AEBTPP, and based on wet limestone process and the process will have an efficiency of 95%. For the planned project, flue gas discharge is planned from cooling tower after treatment.

AEATPP is located within the Kahramanmaraş Province of Turkey. Location of AEATPP is 14 km far from Afşin District and 30 km from Elbistan District. The nearest settlement places to the AEATPP is Çoğulhan Town, 500 meter from the plant, and Alemdar Town that is about 1 km far from the plant.

Environmental impact area of the project is taken as 20 kmx20 km area for which air quality modelling has been applied in EIA.

Afşin District is located at a point where Mediterranean, Central Anatolia and Eastern Anatolia intersect. Therefore characteristics of these three regions are observed in Afşin. Continental climate dominates. Dry and arid weather dominates in the summer while cold and snowy weather dominates in the winter. Most of the rains are formed during spring and autumn. AEATPP is located on Afşin-Elbistan Plain and the average elevation of the region is about 1100-1300 meter. The land is flat. AEATPP is located on, alluvial, colluvial and forest soil group and the capability class of the soil is Class I. Erosion degree is "less erosion" The soil of the region, where AEATPP is located, has very high lime content and alkaline structure. Therefore the soils of the region have low acidification sensitivity.

Air quality modelling study that made for emissions dispersion shows that maximum ground level concentration of SO_2 and PM exceed the short term limits of RAQP. The concentrations of NOx do not exceed the limits.

CHAPTER II-MITIGATION PLAN

II.1. IMPACTS

Impacts of the project during both construction and operation of the project includes,

- Emissions to air
- Water supply and wastewater discharge
- Solid wastes
- Noise
- Health and Safety

II.2. DESCRIPTION OF PROPOSED MITIGATION MEASURES TO BE APPLIED DURING CONSTRUCTION PHASE

II.2.1. Dust and Other Emissions

The following methods will be applied in order to control emissions to the air during construction phase of the project:

Measures for the dust in Site Operations

- The materials will be enclosed and covered during stockpiling and transport.
- Water sprays will be applied periodically for dust control at site.
- The vehicles delivering materials will have a sped of maximum 30 km/h to prevent dust formation on the roads.

According to "Regulation on Excavation Soil, Construction and Ruins Control" published by 18.03.2004 dated , following item of will be complied.

"People conducting the excavation works are responsible from the taking the precautions reducing the noise and visual pollution and dust emissions and covering of the surrounding of the activity area. Planning is to equalize the soil amount from the excavation and the filling amount and the priority is given to reuse of the excavation soil in the activity area. "

Measures for the Avoidance of Nuisance from Exhaust Emissions

Engines will not be left running unnecessarily to reduce emissions from fuel from engines.

Exhaust emissions of the vehicles will be measured in accordance with Notice on Measurement and Inspection of the Vehicles published by Ministry of Environment on 08.07.2003 dated and 25162 numbered Official Gazette. Exhaust emission sticker and exhaust emission license of the vehicles will be supplied.

All vehicles and equipment will be regularly maintained.

II.2.2. Measures to Minimize Potential Adverse Impacts on Surface and Ground Waters:

The following general measures will be adopted throughout all aspects of construction to minimize potential adverse impacts on surface and ground waters.

Fuelling, washing or maintenance of plant or machinery will not occur in, over or 1 km adjacent to a drain or water spring.
All discharges to surface and groundwaters, including effluents from wastewater treatment plants, will met both World Bank and Turkish RWPC water discharge standards. Discharge standards are given by the table below.

Domestic Wastewater Discharge Standards:

PARAMETER	UNIT	COMPOZITE SAMPLE 2 Hour	COMPOZITE SAMPLE 24 Hour
Biochemical Oxygen Demand (BOD_5)	(mg/L)	50	45
Chemical Oxygen Demand (COD)	(mg/L)	180	120
Suspended Solids (SS)	(mg/L)	70	45
pH	-	6-9	6-9

Source: RWPC Table 21.1 Sector: Domestic Wastewater (Class 1: Pollution Load is between 5-60 kg/day as raw BOD, Population=84-1000)

- As required by Turkish RWPC, "Discharge Permit" will be obtained in order to effluent discharge from waste waster treatment plant

II.2.3. Controlling Noise

Construction working hours will be determined by EÜAŞ prior to commencing work.
All equipments used will be adequately maintained to minimize noise emissions
All items of equipments operating on the site in intermittent use will be shut down in the intervening periods between periods of use.
Any item of plant or equipment found to be emitting excessive noise levels due to a faulty silencer, broken or other reason, will immediately be taken out of service and be adequately serviced, repaired or replaced.
Site personnel will be trained for the proper use and maintenance of tools and equipment, and the proper positioning of machinery on site.

II.2.4. Waste Minimization

The following measures will be taken to avoid waste generation and minimize both quantities and hazards of waste generated.

All hazardous wastes, non-hazardous wastes and inert wastes including the recyclable ones and non recyclable ones will be stored at site separately and the ones that could be recyclable will be segregated and treated at site. The records of these applications will also be kept.

- Principally all the waste generated during construction works will be minimized by the contractor and as much as possible, biologically degradable wastes would be produced.
- The staff and the workers are trained for generating less waste. Supervision will be supplied to increase environmentally awareness of the workers.
- Hazardous wastes will be stored separately so that there will be no contamination to the non hazardous wastes.
- Biologically degradable kitchen wastes are going to be collected at bins at the power plant.
- Storm waters will be collected by surface collectors.

Waste Disposal

Recyclable / Reusable Non- Hazardous & Inert Wastes

Paper, glass, plastic, metal, aluminum cans, etc., will be segregated and collected at site. These wastes will then be sent to recycling facilities. Before waste is sent for recycling or reusing to recycling facilities, they will be audited by the Environmental Officer. Rehabilitation wastes will be sold as scrap.

Non-Reusable / Non-Recyclable Non-Hazardous wastes

Non-reusable/non-recyclable non-hazardous wastes will be stored seperatelly until its taken for the disposal.

Organic Wastes

Organic wastes will be collected on site by the bins.

Sewage Sludge Disposal

Sewage sludge will be disposed in accordance with the requirements of the Regulation on Hazardous Waste Control. If the analysis of the sewage sludge shows that it is hazardous waste according to Appendix 11A of the regulation, sludge will be disposed of in accordance with the requirements of the Regulation on Hazardous Waste Control.

Hazardous Waste Disposal

The hazardous waste that may be produced during construction may be used batteries, bitumen, cables, copper, fire-fighting foam, adhesives, chemicals, acids, absorbents, solvents, contaminated soils, insulation, paint sludge, used oil and paint cans etc.. Hazardous wastes will be disposed at licensed disposal center. In this phase, all wastes will be segregated and will be stored in a safe manner until taken for the final disposal. Transportation of the hazardous wastes will be carried out by the licensed vehicles.

Medical Wastes

Medical wastes from medical center in the plant will be sent to a licensed plant for incineration. At this stage, all types of waste will be segregated and stored in the designated waste storage area at the site in a secure manner until it is taken by Municipality for disposal.

Waste Collection and Storage

Wastes will be collected and temporarily stored at the place of generation in a safe and environmentally sound manner at waste collection points prior to collection and transferring to a centralized waste accumulation area. Suitable waste containers will be provided at the places of waste generation to facilitate safe and environmentally sound temporary storage. All containers will be clearly marked according to contents such as paper, glass, plastic and garbage

Waste Transportation

Wastes will be taken from the place of waste accumulation area by the private company for transportation to final disposal. Licensed companies will be used for transportation.

II.2.5. Wastewater

Consumption water during the construction phase of the project will be supplied from Ceyhan Spring as it is currently. Wastewater to be produced will be treated by the plant's sewage treatment system and after treatment the effluent will be discharged to Çoğulhan River. Effluent will met Water discharge standards of RWPC. There will not be additional wastewater from the FGD system.

Sludge from the wastewater treatment plant will be disposed in compliance with RSWC. Sludge will be sent to solid waste disposal site of Afşin Municipality.

II.2.6. Health and Safety

The risks posed to human health are possible industrial accidents resulting from the construction works requiring use of heavy construction equipment. These accidents are generally caused by carelessness and ignorance of safety instructions.

In order to minimize these risks, in compliance with Regulation on Work Health and Safety came into force by 09.12.2003 date and 25311 numbered Official Gazette and Worker Health, following issues will be applied.

- Qualified personnel will be employed for the construction machines and equipments and all personnel will be trained for health and safety issues.
- Personnel protection equipment will be supplied and used properly.
- Personnel will be controlled for use of protection equipment.
- Present health centre and health staff will be ready for the incidents on site.
- The measures will be taken for fire fighting.

The occupational hazards and related personnel protective equipment are given by the table below.

Objective	Occupational Hazards	Personnel Protective Equipment
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light	Glasses, shields, protective shades, etc.
Head protection	Falling objects, inadequate height clearance, and overhead power cords.	Helmets with or without electrical protection.
Hearing protection	Noise	Hearing protectors.
Foot protection	Falling or rolling objects, liquids.	Safety shoes or boots
Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures.	Gloves made of rubber or synthetic materials, leather, steel, insulating materials, etc.
Respiratory protection	Dust, fogs, fumes, mists, gases, oxygen deficiency.	Face masks with appropriate filters for dust removal and air purification (chemicals and gases) or air supply.
Body/leg protection	Extreme temperatures, hazardous materials, biological materials, cutting and laceration.	Insulating clothing, body suits, aprons etc. of appropriate materials.

II.3. DESCRIPTION OF PROPOSED MITIGATION MEASURES TO BE APPLIED DURING OPERATION PHASE

II.3.1. Mitigation Measures for Controlling Emissions to Air

By AEATPP Rehabilitation Project, high PM and SO_2 concentrations will be decreased below the limits of RIAPC. Ground level concentrations of the emissions will be below the long term and short term limits of the Article 6 of RAQP.

ESPs, FGD unit and its auxiliaries will be regularly maintained.

Discharge of stacks gases will be supplied by the discharge from the cooling tower instead of using the stacks, which will provide more dilute dispersion of the emissions.

Ambient air quality of the region will be monitored by installing measurement station at the point where the highest concentrations deposits.

Emission license will be taken for the power plant.

II.3.2. Mitigation Measures for Controlling Noise

- Noise protection equipment such as earmuffs will be provided for workers in high noise level areas. Regulation on Work Health and Safety will be applied.
- The workers will be periodically rotated in high noise impact areas to minimize the impact.
- All equipments will be adequately and periodically maintained to minimize noise emissions

- Warning signs will be installed in areas where high noise level is observed.
- In case not required, all equipments will be switched off.
- Any item of plant or equipment found to be emitting excessive noise levels due to a faulty silencer, broken or other reason, will immediately be taken out of service and be adequately serviced, repaired or replaced.
- Personnel will be trained for the proper use and maintenance of tools and equipment,

II.3.3. Mitigation Measures for Controlling Wastewater Discharge

Both domestic and industrial wastewater produced at the plant will be discharged to receiving body after treated at the domestic and ash water treatment plants, respectively.

The periodical controls of the wastewater treatment plants will be maintained. Discharge parameters will monitored by the laboratory.

The gypsum produced at FGD unit will be disposed at mining site after mixed with the ash and slag in the power plant will be transferred to the deposit site by closed conveyors. The low solubility of both ash and gypsum decreases the ground water pollution risk. No heavy metal leakage is expected since the natural pH of the soil in the area is basic.

II.3.4. Mitigation Measures for Waste Management

Waste management will be supplied to avoid any direct or indirect impacts on the health and well being of people and the environment.

The wastes produced at the plant will be formed by domestic and process solid wastes. The following issues would have importance in waste management;

- waste avoidance,
- minimization of quantities and hazards of waste generated,
- reuse, recovery and recycling of waste,
- disposal of waste.

Regular waste disposal will be provided in the plant. The wastes will be collected and stored according to their content. The following steps will be taken to avoid waste generation and minimize both quantities and hazards of waste generated.

- Principally all the waste generated by the contractor during operation phase will be minimized and biodegradable.
- The staff and the workers are trained for generating less waste if there is any possible substitution for the method to be applied. Environmentally soundness will be mainstream of the works to be realized.
- Hazardous wastes will be stored separately from non hazardous wastes so that there will be no contamination to the non hazardous wastes.
- Biologically degradable wastes are going to be collected at bins at the power plant.
- Storm waters will be collected by surface collectors.

Waste Disposal

Recyclable / Reusable Non- Hazardous & Inert Wastes

Paper, glass, plastic, metal, aluminum etc., will be segregated and collected at site. These wastes will then be sent to recycling facilities. Before waste is sent for recycling or reusing to recycling facilities, they will be audited by the Environmental Officer.

Non-Reusable / Non-Recyclable Non-Hazardous wastes

Non-reusable / non-recyclable non-hazardous wastes will be deposited at a different place until the disposal.

Organic Wastes

Organic wastes composed of food wastes will be collected on site by the bins.

Wastewater Treatment Plant Sludge Disposal

Treatment plant sludge will be disposed of in accordance with the requirements of the RSWC. If the analysis of the sewage sludge shows that it is hazardous waste according to Appendix 11A of the Regulation on Hazardous Waste Control, sludge will be disposed of in accordance with the requirements of the Regulation on Hazardous Waste Control.

Hazardous Waste Disposal

The hazardous waste that may be produced during operation may be used batteries, bitumen, cables, copper, fire-fighting foam, adhesives, chemicals, acids, absorbents, solvents, insulation, paint sludge, oil and paint cans etc. Hazardous waste generated on the project, which could not be recycled, reused, reduced, or treated onsite, will be disposed of at the licensed plant for incineration. At this stage all types of waste will be segregated and stored in the designated waste storage area at the site in a secure manner until a satisfactory disposal facility is chosen which.

Gypsum from Process

Gypsum produced in the thermal plant during the process will be mixed with ash and slag and then send to sites where mine is extracted from and disposed at this site.

Medical Wastes

Medical wastes will be sent to a licensed plant for incineration. At this stage all types of waste will be segregated and stored in the designated waste storage area at the site in a secure manner until it is sent to selected incineration plant.

Waste Collection and Storage

Wastes will be collected and temporarily stored at the place of generation in a safe and environmentally sound manner at waste collection points prior to collection and transferring to a centralized waste accumulation area. Suitable waste containers will be provided at the places of waste generation to facilitate safe and environmentally sound temporary storage. All containers will be clearly marked according to contents.

Waste Transportation

Wastes will be taken from the place of waste accumulation area by the private company for transportation with licensed vehicles to final disposal.

II.3.5. Mitigation Measures for Health and Safety

There will be impact of dust, SO_2, noise, chemicals, and accidents on workers, . The use of protective equipment will be enforced as a standard practice. The occupational hazards and related personnel protective equipment are given by the table below.

Objective	Occupational Hazards	Personnel Protective Equipment
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light	Glasses, shields, protective shades, etc.
Head protection	Falling objects, inadequate height clearance, and overhead power cords.	Helmets with or without electrical protection.
Hearing protection	Noise	Hearing protectors.
Foot protection	Falling or rolling objects,. Liquids.	Safety shoes and boots.
Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures.	Gloves made of rubber, synthetic or , leather, steel, materials
Respiratory protection	Dust, fogs, fumes, mists, gases, , oxygen deficiency.	Face masks with appropriate filters for dust removal and air purification
Body/leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration.	Insulating appropriate work clothes.

Accident risks during operation of the power plant are usual. The warning signs at the power plant will be installed. The whole personnel will be trained on health and safety issue.

II.4. Summary of Mitigation Plan

Phase	Issue	Mitigating Measure	Responsibility
Construction	Dust emissions from the excavation works	The materials will be enclosed and covered during stockpiling. The dust producing activities will be controlled for prevention of dust. Water sprays will be applied for dust control at site when necessary. The vehicles delivering materials will have a sped of maximum 30 km/h.	Contactor and EÜAŞ
Construction	General vehicle traffic and heavy construction vehicles. Fugitive emissions effecting air quality	Engines will not be left running unnecessarily to reduce emissions from fuel from engines Exhaust emissions of the vehicles will be measured. Exhaust emission sticker and exhaust emission license of the vehicles will be supplied.	Contactor and EÜAŞ
Construction	Domestic waste water discharge Domestic waste water treatment plant sludge disposal	Control of wastewater treatment plant units will be conducted regularly. Chemicals used in treatment plant will regularly be supplied. Discharge license will be taken for the power plant Sludge from the treatment plant will be disposed in accordance with RSWC.	Contactor and EÜAŞ

Phase	Issue	Mitigating Measure	Responsibility
Construction	Solid wastes -Recyclable / Reusable Non-Hazardous & Inert Wastes -Non-Reusable / Non-Recyclable Non-Hazardous wastes -Hazardous Wastes -Medical Wastes	The wastes will be separately according to their contents. Storage containers will be labeled. The medical wastes will be collected by red, hazardous wastes will be collected by orange and non hazardous wastes will be collected by blue bags. Hazardous wastes will be transported by licensed company. Rehabilitation wastes will be sold as scrap.	Contactor and EÜAŞ
Construction	Noise	Construction work will be conducted during the defined hours of the day these hours will not be exceeded. In case not required, all equipments will be switched off. All equipments used will be adequately maintained. The noise emissions will not be permitted to exceed the noise limits of Turkish and World Bank Limits. Any item of plant or equipment found to be emitting excessive noise levels due to a faulty silencer, broken or other reason, will immediately be taken out of service and be adequately serviced, repaired or replaced. Site personnel will be trained for proper use and maintenance of tools and equipment.	Contactor and EÜAŞ

Phase	Issue	Mitigating Measure	Responsibility
Construction	Protected Species	1-Regarding strictly protected species the following actions are prohibited (Article 6); ▪ all forms of deliberate capture and keeping and deliberate killing; ▪ the deliberate damage to or destruction of breeding or resting sites; ▪ the deliberate disturbance of wild fauna, particularly during the period of breeding, rearing and hibernation, insofar as disturbance would be significant in relation to the objectives of this Convention; ▪ the deliberate destruction or taking of eggs from the wild or keeping these eggs even if empty; ▪ the possession of and internal trade in these animals, alive or dead, including stuffed animals and any readily recognizable part or derivative thereof, where this would contribute to the effectiveness of the provisions of this article. 2- Regarding protected fauna species (Article 7); Measures to be taken shall include: ▪ closed seasons and/or other procedures regulating the exploitation; ▪ the temporary or local prohibition of exploitation, as appropriate, in order to restore satisfactory population levels; ▪ the regulation as appropriate of sale, keeping for sale, transport for sale or offering for sale of live and dead wild animals	Contactor and EÜAŞ
Construction	Health and safety	Personnel protective equipments will be supplied for the personnel. Warning signs will be installed where the industrial accident risk is high. Personnel will be trained on Health and Safety measures.	Contactor and EÜAŞ

Phase	Issue	Mitigating Measure	Responsibility
Operation	Emissions to air	FGD unit retrofit to AEATPP will supply decrease in SO_2 emissions. FGD unit and its auxiliary equipment will be maintained regularly. The flue gas will be discharged from the cooling tower instead of using the stacks. Rehabilitated ESPs will be regularly maintained. Emitted gas discharge will be monitored by continuous emission monitoring system in cooling tower. Ambient air quality of the region will be monitored by installing measurement station at the point where the highest concentrations deposits. Emission license will be taken for the power plant.	EÜAŞ AEATPP Operation Management
Operation	Noise	Noise protection equipment will be provided for workers in high noise level areas. All equipments will be periodically maintained to Warning signs will be installed in high noise level areas. Personnel will be trained in the proper use and maintenance of tools and equipment.	EÜAŞ AEATPP Operation Management
Operation	Waste Management Recyclable / Reusable non-hazardous & inert wastes -Non-Reusable / Non-Recyclable Non-Hazardous wastes -Hazardous Wastes -Medical Wastes	The wastes will be separated according to their contents. All storage containers will be labeled. The medical wastes will be collected by red, hazardous wastes will be orange and non hazardous wastes will be collected in blue bags. Hazardous wastes will be transported by licensed company for disposal of the hazardous wastes. Sludge from wastewater treatment plants will be disposed according to RSWC. It will be sent to	EÜAŞ AEATPP Operation Management

Phase	Issue	Mitigating Measure	Responsibility
		solid waste area of Municipality. Gypsum from FGD operation will be sent to mine site after mixing with ash and slag by the closed conveyors.	
Operation	Wastewater Management	Both process and domestic wastewater produced at the plant will be treated at the wastewater treatment plants and then discharged to receiving body. Wastewater discharge parameters will be monitored weekly. Discharge permit will be obtained.	EÜAŞ AEATPP Operation Management
Operation	Health and Safety	As a standard application, Personnel protective equipments will be supplied Warning signs will be installed where the industrial accident risk is high. Personnel will be trained on Health and Safety measures.	EÜAŞ AEATPP Operation Management

Contingency Plan

A Contingency Plan will be developed to outline procedures incase of an accident or emergency. The Contingency Plan will contain Emergency Response Plans for the following situations:

- Fuel or chemical spills;
- Natural disasters;
- Fires/explosions;
- Medical emergencies/accidents;
- Off-site emergency responses;
- Power failure/outage; and
- Security matters

Not every emergency can be foreseen. However, well-designed Emergency Response Plans coupled with proper training of emergency response personnel should adequately resolve most situations. Emergency response personnel and other trained site personnel would also be available to the local community in the event of a major natural disaster or a problem at some other industrial facility. Emergency Response Plans will include institutional coordination, communications, and public relations.

Emergency Response Plans

Preparation of the Emergency Response Plans will be coordinated with EÜAŞ and local community emergency response agencies so that non governmental agencies are aware of potential emergency situations and the emergency plans and capabilities of the site personnel.

The detailed Emergency Response Plans will be prepared during detailed Project design to cover construction stage and will be updated during the construction phase to address changing current site situations. The Emergency Response Plans will be periodically evaluated and updated in response to new site information and conditions, changes in operations and personnel and/or as follow-up to any specific emergencies that may occur. Appropriate regularly record keeping will be maintained for all significant environmental matters, (including injuries/accidents, spills, fires and other emergencies).

Copies of the Emergency Response Plans will be available at the site in locations known to all workers. The following information will be posted in strategic locations at the site:

General emergency implementations;

Emergency telephone numbers/communication phases;

Location of emergency showers, and/or eye washes;

Emergency escape routes, and

Route map to nearest medical facility.

The emergency implementation procedures outlined in the Emergency Response Plans will be rehearsed regularly as part of the employee training program.

Responsibility

An Emergency Response Coordinator will be responsible for supervising and coordinating all emergency responses. The Emergency Response Coordinator will also be responsible for preparing/updating the Emergency Response Plans, and employee training.

Emergencies

All emergencies will require immediate action, with priorities of:

Protecting human lives and preventing injury;

Protecting the environment and mitigating damage;

Protecting equipment in the power plant and

Minimizing disruption or interference to AEATPP' business activities.

The following section outlines the responsibilities and procedural sequences of the events following the discovery of an emergency situation. An emergency situation may be defined as an incident that may cause personnel injury, uncontrolled damage and/or disruption of business. Examples of such cases would be a fire, a chemical spill and/or a

General Emergency Procedures

Any employee discovering a potential emergency situation shall notify their immediate supervisor as soon as practicable after the discovery. The supervisor shall immediately investigate the situation and obtain all of the relevant information, take initial action to remedy or alleviate the situation and notify the Site Manager as soon as practicable with all the pertinent information.

The Site Manager shall immediately notify the Emergency Response Coordinator and the General Manager and inform them of the nature of the emergency and the actions taken. The General Manager or his designated alternate will make the decision to declare an EMERGENCY.

Once an EMERGENCY has been declared, all key response personnel will congregate at the designated command center on site. The Site Manager shall contact the appropriate authorities and provide the necessary information as approved by the General Manager. The Emergency Response Coordinator shall coordinate corrective actions with the appropriate agencies.

The emergency response will vary with the nature and circumstances of the emergency. Some emergencies will require the services of a response team. When a situation exists that may warrant the declaration of an emergency after day shift hours, the on-site manager can be notified through the site communication system. It is his responsibility to notify those persons on the emergency response team. A list and location of the team members will be known at all times and posted for easy access.

After the emergency has been successfully controlled, a final report and response assessment will be prepared.

CHAPTER III-MONITORING PLAN

III.1. Description of Monitoring Programs and Parameters

This section outlines the specific monitoring parameters, and expected frequencies.

The scope of this monitoring program includes receiving watercourses, air emissions noise and soils. This monitoring program is not designed to detect long-term changes in ecosystems, but will serve as an early warning system whereby construction activities can be modified where necessary to remain within project environmental standards. Monitoring data will be used in the project quality assurance process and will be compared to project environmental standards.

The goal in implementing an inspection and monitoring program is to ensure complete compliance with the EIA with regard to mitigation measures and permit conditions and requirements. The methods and procedures presented in this document are intended to assure the completion of an effective monitoring program.

III.2. Elements of the Monitoring Program

It is neither necessary, nor practicable, to continuously monitor all potentially affected environmental parameters. Ultimately a monitoring program is a compromise that can effectively serve to characterize existing and future environmental conditions to detect unacceptable changes.

The monitoring program, by systematic sampling, will assess the quantity and quality of project discharges. In general, monitoring data derived for noise, solid waste and air will be compared to project environmental standards.

The monitoring should be conducted at the points where baseline Environmental Monitoring studies were carried out. In addition to that as the air quality modeling results are obtained the maximum ground level concentration (GLC) point will be determined, this point should be selected for further monitoring.

Monitoring during the construction will be conducted in monthly basis where the monitoring of the operation will be conducted in seasonal basis. Regulation on Industrial Air Pollution Control states that the sampling with the passive diffusion tubes should cover at least two months period. In this scope, in two months, 3 samplings each is 20 day period will be conducted and this study will be repeated 3 times a year.

Emissions from the plant will be monitored in compliance with Article 40-a of the RIAPC.

The responsibility of these monitoring applications will be under the responsibility of EUAŞ.

III.3. Implementation of the Monitoring Program

Monitoring personnel will be provided trained in sample collection techniques, maintenance of equipment, sample labeling and transport, record keeping, tracking waste movements, and reporting procedures.

Appropriate equipment will be employed in the sampling program, including sampling devices (such as containers, storage, instantaneous water quality, automatic air and noise monitoring devices, weight/volume devices, data recorders).

Where direct on-site measurement is required, staff will be trained in the use of appropriate equipment and record data and undertake any interpretation that will be necessary to facilitate rapid response.

A record keeping system for monitoring data will be developed. The database will be available at the power plant management.

III.3. Scope of the Monitoring

Phase	**What** parameter to be monitored	**Where** is the parameter to be monitored	**How** is the parameter to be monitored	**When** is the parameter to be monitored	**Monitoring Cost** (unless indicated so the values are yearly)	**Responsibility**
CONSTRUCTION						
Air Quality	Dust	At power plant site and around power plant site	Observation	Daily	-	Contractor EÜAŞ
Noise	Noise level	If any complaints occur at nearby surroundings of the power plant	12 hour noise level measurement by noise level measurement device	Weekly	60 YTL x number of measurement point	Contractor EÜAŞ
Water Quality	Chemical Oxygen Demand Suspended Solids Biochemical Oxygen Demand pH	At effluent of wastewater water treatment plant	The analysis will be conducted in a Ministry of Environment approved laboratory	Weekly	115 YTL per week	Contractor EÜAŞ

Phase	**What** parameter to be monitored	**Where** is the parameter to be monitored	**How** is the parameter to be monitored	**When** is the parameter to be monitored	**Monitoring Cost** (unless indicated so the values are yearly)	**Responsibility**
OPERATION						
Air Quality	Stack dust and smog		Dust sampling device in Stack Routine controls twice in a year	Continuous	39000 YTL (if not in the scope of the FGD system it will be bought)	EÜAŞ AEATPP Operation Directorate
	Stack Gas		Stack gas measurement device (SO_2, NOx, CO) Routine controls twice in a year	Continuous	26000 YTL (if not in the scope of FGD system it will be bought)	
	Dust (PM_{10}) SO_2 NOx	The points where the maximum GLC is detected	Air quality measurement station	Continuous	75000 YTL	

Phase	**What** parameter to be monitored	**Where** is the parameter to be monitored	**How** is the parameter to be monitored	**When** is the parameter to be monitored	**Monitoring Cost** (unless indicated so the values are yearly)	**Responsibility**
Noise	Noise levels	At the 7 receptors of the points where baseline EIA studies were conducted	Noise level meter 12 hour measurements will be conducted	Seasonal (4 times in a year)	60 YTLx7 pointsx4 times in a year	EÜAŞ AEATPP Operation Directorate
Water Quality	Appendix 11 A of Hazardous Wastes Control Regulation: pH Total Organic Carbon As (mg/l) Cd (mg/l) Cr^{+6} (mg/l) Cu (mg/l) Hg (mg/l) CN (mg/l) Ni (mg/l) Pb (mg/l) Ammonia gN/L	At two groundwater sources	Sampling will be conducted in compliance with the related sample preservation standards and the analysis will be conducted in a Ministry of Environment approved laboratory	Seasonal (4 times in a year)	1500 YTL x 2 wells x 4 times in a year	EÜAŞ AEATPP Operation Directorate

Phase	**What** parameter to be monitored	**Where** is the parameter to be monitored	**How** is the parameter to be monitored	**When** is the parameter to be monitored	**Monitoring Cost** (unless indicated so the values are yearly)	**Responsibility**
	NO_3 (g/l) Zn (mg/l) Cl (g/l) F (mg/l) Sulfate (g/l) Halogenous Organics Compounds (AOX) (mg/l) Phenols (mg/l) Thinners and solvents (Cl/l) Pesticides (µg Cl/l) Soluble Matters in the Oil (mg/lt)					
	pH, DO, conductivity, TDS, total hardness, COD, BOD, NO_3, NO_3^- N, F, Cl, CN, Zn, Cu, Fe, SO_4, PO_4^-P, Mg,	Two surface water sources.		Seasonal (4 times in a year)	1000 YTL x 2 samples x 4 times in a year	

Phase	**What** parameter to be monitored	**Where** is the parameter to be monitored	**How** is the parameter to be monitored	**When** is the parameter to be monitored	**Monitoring Cost** (unless indicated so the values are yearly)	**Responsibility**
	As					
	COD Suspended Solids Oil and Grease Total Phosporous Total Cyanide (CN^-) **Temperature** pH TDS Cr^{+6}	At effluent of water treatment plants		Weekly	315 YTL /week	
Soil Quality	Appendix 11 A of Hazardous Wastes Control Regulation pH Total Organic Carbon As (mg/lt) Cd (mg/l) Cr^{+6} (mg/l)	At the 2 points where baseline EIA studies were conducted	Sampling will be conducted in compliance with the related sample preservation standards and the analysis will be conducted in a Ministry of	2 times in a year (totally five year, beginning from one year before the construction,)	1500 YTL x 2 points x 2 times in a year	

Phase	**What** parameter to be monitored	**Where** is the parameter to be monitored	**How** is the parameter to be monitored	**When** is the parameter to be monitored	**Monitoring Cost** (unless indicated so the values are yearly)	**Responsibility**
	Cu (mg/l) Hg (mg/l) CN (mg/l) Ni (mg/l) Pb (mg/l) Ammonia gN/L NO_3 (g/l) Zn (mg/l) Cl (g/l) F (mg/l) Sulfate (g/l) Halogenous Organics (AOX) (mg/l) Phenols (mg/l) Thinners and solvents (Cl/l) Pesticides (µg Cl/l) Soluble Matters in the Oil (mg/lt)		Environment approved laboratory.			

Phase	**What** parameter to be monitored	**Where** is the parameter to be monitored	**How** is the parameter to be monitored	**When** is the parameter to be monitored	**Monitoring Cost** (unless indicated so the values are yearly)	**Responsibility**
Soil Quality	Texture, salinity, pH, lime, phosphor, potassium, organic matter, TOC and total nitrogen.	At 8 locations where baseline EIA studies were conducted		2 times in a year (totally five year, beginning from one year before the construction,)	600 YTL x 8 points x 2 times in a year	EÜAŞ AEATPP Operation Directorate

CHAPTER IV-INSTITUTIONAL STRENGTHENING

IV.1. Equipment Purchases

Type of Equipment	Number of Units	Unit Cost	Total Cost	Type of Purchase
Continuous Emission Monitoring System	1	20000 USD	20000 USD	International Purchase
Ambient air measurement device	1	75000 USD	60000 USD	International Purchase

IV.2. Training

Environmental training will be provided at each stage of the Project, from initial establishment of logistical facilities through to construction and operation.

Maintaining Environmental Awareness

The contactor will erect and maintain notices and signs on site to indicate the defined environmentally important and/or sensitive areas affected by construction or operational activities.

Environmental Awareness Training

All personnel will be given environmental awareness training. Key project personnel whose management roles or job responsibilities/activities may have an impact on the environment will also receive training specific to their issues of concern. A separate course will be developed for the workers so they have a basic understanding of their role in environmental protection.

Training will be provided at each stage of the project.

Types of Training

Several types of trainings will be offered that are stated in the matrix below.

Training Content

Training programs will be prepared in a Power-Point format using photographs, drawings, maps, and text. In large rooms, the program will be projected on a screen; when only a few individuals are to be trained, the program might be viewed on a laptop computer.

Following are subjects will be covered in the typical environmental training sessions:

- Objectives of training,
- Regulations requiring environmental compliance,
- Role of environmental inspectors,
- Dust control and vehicle emissions,
- Management of fuels and hazardous materials,
- Waste leakage prevention, pollution control, mitigation measures,
- Waste management,
- Reporting environmental problems, and
- Other topics to be included as required by the EIA or requested by the EUAŞ.

A sign-in sheet will be circulated during each training session to record the names of all persons who have attended the training. These sheets will be maintained in a file by the environmental officer. Upon completion of the training, all site personnel will be issued with authorized training cards.

Waste Management Training

EÜAŞ will provide sufficient training to all staff to ensure that they are aware of the relevant aspects of the waste management and are able to fulfill their waste management roles and functions. Training of staff will be recorded in personnel records.

Pollution Prevention and Control Training

The training programs will ensure that all personnel involved will;

- fully understand the pollution prevention and control requirements and how they will be implemented,

be aware of the respective roles of contractor staff and the EÜAŞ representatives for pollution prevention and control.

This training program could be presented by the official training lectures, field training or professional guidance.

Monitoring, Inspection and Auditing

EÜAŞ will implement a program of inspection, audit and monitoring in line with the requirements outlined in the EMP to ensure the existence and effectiveness of environmental mitigations outlined in this plan. This will also enable environmental problems to be identified and responded to at an early stage.

TRAINING MATRIX (For both Construction and Operation)					
Trainee	**Topic**	**Duration**	**Frequency**	**Where/How**	**Trainer**
All plant personnel	Emergency Response Plan	10 h	Annual	At power plant's meeting room as sessions	Certified institutions
	Risk Prevention Program	10 h	Annual		Certified institutions
Environmental Officer, HSE Officer, Plant manager	Environmental record keeping	2 h	Annual		Certified institutions
	Waste management	4 h			
	Noise management	2 h			
	Air quality management	5 h			
	Training skills	2 h			
HS Officer	Health and Safety	5 h	Annual		Certified institutions
Operation and Maintenance Personnel	Environmental awareness and understanding of environmental regulations and plant responsibilities	4 h	Annual	At power plant's meeting room as sessions and at the field conditions.	Environmental Officer, HSEOfficer
	Waste management	2 h	Annual		Environmental Officer
	Noise management	1 h	Annual		Environmental Officer
	Air quality management	4 h	Annual		Environmental Officer
Operation Manager,	EM procedures and requirements	4 h	Annual	At power plant's meeting room as sessions	Environmental Officer, HSEOfficer

TRAINING COURSE/SESSION FORM

Subject:
Date:
Duration:
Instructor:
Name of participant:

EMPLOYEE TRAINING RECORD

Name of Employee:		
Participated in the Following Training Courses/Sessions:		
Training	Date	Hours
Training Pending	Reason	Schedule
Training Scheduled		

IV.3. Personnel Assignment and Employment

The personnel will be assigned for Environmental and Health requirements after rehabilitation of power plant. At least one environmental engineer will be employed for this purpose.

CHAPTER V- SCHEDULE

Construction Phase

	Year 1				Year 2			
Activity	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Mitigation Measures								
Monitoring								
Training								

Operation Phase

	Year 1				Year 2				Year n			
Activity	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Mitigation Measures												
Monitoring												
Institutional Strengthening												
Training												

CHAPTER VI- INSTITUTIONAL STRENGTHENING

Roles and responsibilities of the personnel AEATPP are defined by the table below.

Name/title	Responsibility	Duties
Plant manager	Plant manager is responsible for the entire functioning of the plant in compliance with all rules and regulations including environmental legislation.	• All administrative issues, • Handling of the problems at the plant, • Communication with Environmental Officer, and • Reviewing the environmental documents.
Shift Supervisor	Personnel control	• Plant operation, • Responsibility of immediate actions, and • Implementation of HSE issues.
Maintenance Personnel	Responsible for maintenance schedules	• Plant maintenance, and • Implementation of HSE issues.
Health and Safety Engineer	health and safety issues	• Coordination of all actions related to health and safety, • Writing reports and collecting documentation, and • Training of the plant personnel on HSE.
Environmental Officer	Responsible for all environmental aspects, including legislation, monitoring, observation of measures, writing reports and ensuring of implementation of legislative issues	• Coordination of all actions related to environment, • Management of environmental monitoring, • Management of mitigation measures on environment,

Name/title	Responsibility	Duties
		• Writing weekly/monthly reports to Plant Management, • Coordination with General Directorate of EUAŞ, • Performing daily inspections, • Keeping all environmental documentation, and Training of the personnel on environmental awareness.

Environmental Officer/Engineer

- To prepare, implement, and monitor the project environmental plans,
- To ensure the preparation of the environmental risk assessment of the project,
- To follow the changes in the environmental laws, regulations,
- To schedule the environmental training,
- To prepare Emergency Response Plan,
- To do daily inspections,
- To arrange the reports,
- To investigate the causes of the environmental accidents,
- To audit and inspect the contractors in the environmental point of view,
- To keep the environmental records,
- To take the required environmental permissions from associations,
- To attend the environmental meetings, to inform the participants about the environmental performance,
- To ensure the elimination of the environmental risks,
- To prepare a list of the environmental activities resources,
- To inform on environmental incidents are provided to EÜAŞ immediately,
- Appropriate mechanisms are developed and implemented for dealing with unforeseen events,
- A program of regular environmental self-inspection and audit is developed and implemented and the results are reported to EÜAŞ on a regular basis,
- Summary reports on compliance with environmental requirements are provided to EÜAŞ on a weekly basis and the attendance of the contractors Environmental Officer at progress meetings on a weekly basis, and
- To ensure implementation of and adherence to the mitigation measures outlined in the EIA.

Documentation

The environmental management activities will be documented in order to followed to effectively manage the environmental performance of the project. Non-compliance observations, decisions on identified issues, solutions, corrective and preventive actions taken and the results of these actions will be documented.

The environmental activities conducted at construction site and environmental complaints will be reported by EO by use of environmental compliance checklists filled out. In addition to that, the reports will include the site observations of EO too.

The reporting of monitoring results should involve presentation and summary of monitoring results, related information and complaints in an effective way.

The recording of these reports will be the responsibility of EO. Weekly reports for the construction phase and monthly reports for the operation phase will be produced by the EO and submitted to the construction manager and operational manager. Environmental activities and, environmental incidents will be reported both for construction and operation phases.

CHAPTER VII-CONSULTATION WITH LOCAL NGO's AND PROJECT AFFECTED GROUPS

Consultation Activities

The degree of consultation for the construction and operation of the project includes the following issues;

(i) notification of local communities related to project activities in

- Çoğulhan Town
- Alemdar Town
- Afşin District
- Elbistan District

(ii) disclosure of the results of monitoring programs to local communities and other stakeholders;

- Results of the monitoring will be submitted to Kahramanmaraş Provincial Directorate of Environment and Forest and Ministry of Environment and Forest.
- The results of the monitoring will be submitted for public when a request occurs.

ANNEX A.2.

POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

Rehabilitation of AEATPP and Construction of FGD Unit Project will be designed, built and operated in a manner intended to conform with a number of legislative and regulatory requirements and other guidelines and policies, the main categories of which are set below:

-National Legislation
-World Bank Policies;
-International Conventions in force in Turkey;

Project will be implemented in accordance with standards, practices and guidelines requiring conduct that will, in many instances, exceed those legal requirements.

Environmental Assessment Policy of World Bank

In accordance with requirements of O.D. 4.01 (Environmental Assessment), this project has been assigned an environmental category "A". EIA Studies have been conducted to meet World Bank requirements. Mitigating measures for air, water and soil pollution are designed to meet all Turkish (national and local) requirements and/or World Bank environmental guidelines, whichever are stricter. In the absence of either, international standards or codes of practice was be used.

Environmental Legislation in Turkey

The protection of environment and public health from pollution arising from energy production and consumption activities is one of the principles of the Turkish national energy policy. In conjunction with this policy, in 1983 "Environment Law" was promulgated in which the general principles of the Turkish environment policies were established.

The Environment Law (coded 2872) which came into force in 1983 starts from the principle of the "the polluter pays" and handles the environmental issue on a very broad scope. The aim of the Law, which considers the environment as a whole is not only to prevent and eliminate pollution, but also to allow for the management of the natural and historical values and the land in such a way as to utilize and preserve such richness to concern for the future generations as well. The measures to be taken and the arrangements to be made should be compatible with the economic and development targets. According to the basic principles that govern the application of the Environment Law and as stated in constitution, citizens as well as the state bear responsibility for the protection of the environment. The principle in economic activities for determining the implementation of production methods to minimize and solve environmental problems is one of the basic of the Environment Law.

Regulation on Environmental Impact Assessment first was put into force on 7^{th} of February,1993. The purpose of Turkish EIA Regulation is to regulate the administrative and technical principles which will be obeyed during the process of environmental impact assessment to be realized with a view to identify and to evaluate all possible impacts on environment of investment decisions of all public or private organizations, institutions and agencies whose proposed activities may cause environmental problems; to prevent or mitigate the adverse impacts which may cause any harm to the environment and to asses the alternatives of the activities. The regulation was amended two times and the latest Regulation was put into force in 16.12. 2003.

Regulation on Air Quality Protection(RAQP) was formulated in line with the purpose and principles envisaged in the Environment Law and it was issued in November 1986. The Regulation Industrial Air Pollution Control was put into force in 2004.

The purpose of RAQP is to bring under control emissions in the form of soot, smoke, dust, gases, steam and aerosols diffused into the atmosphere as a result of any activities; to protect human beings and their environment from hazards arising from pollution of the air as a receptor medium; to eliminate the adverse effects of air pollution which cause seriously damage to the public and neighbourly relations and to ensure that such effects are not created.

The other regulations complementary to the Environment Law and Public Health Law related' to electrical energy sector are given as follows:

Water Pollution Control Regulation

Regulation set discharged limit values for different waste water streams of thermal power plants

Noise Control Regulation

Regulation sets limits for noise in thermal power plants

Control of Harmful Chemical Substances and Products Regulation prohibits the use of poly chlorinated biphenyls (PCB) which are currently being used in old transformators in old thermal power plants from the beginning of 1995,

Hazardous Waste Control Regulation

Fly ash from thermal power plants and gypsum from FGD plants are considered in the scope of the Regulation and they are required to be disposed in accordance with the rules which will be set by the Ministry of Environment. In addition, some chemical wastes and residual oils which may be disposed from the thermal power plants are required to be used, handled and disposed in accordance with the rules of the Regulation

The evaluation takes into consideration the provisions of the following legal instruments:

Soil:

Turkish Regulation on the Control of Soil Pollution;
Solid Waste Control Regulation;
Hazardous Waste Control Regulation;
Law on Forestry (#6831);
Law on Mobilisation for the National Afforestation and Erosion Control (#4122).

Groundwater resources

Article 12 of the Regulation on Control of Water Pollution (RCWP) presents a classification methodology for groundwater, as set out below:

• Groundwater Class I:
• Groundwater Class II:
• Groundwater Class III

Ecology

Turkish Law:

- Environment Law No. 2872 (11th August 1983)
- National Parks Law No. 2873 (11th August 1983)
- Hunting Law No. 3167 (5th May 1967)
- Law on Establishment and Duties of Ministry of Forestry No. 3800

Turkish Guidance:

- Risk categories devised by the International Union for the Conservation of Nature in 1994
- Risk categories used by Demirsoy (1996), based on the IUCN Red Data Book
- Classification system for risk categories for birds devised by Kiziroglu (1993)

The first and second categories were used to assess all fauna except birds.

International Guidance:

- *World Bank Group:*
- Environmental Assessment Sourcebook: Update Number 20 (Chapter 2) – Biodiversity and Environmental Assessment
- Environmental Assessment Sourcebook: Update Number 10 (Chapter 2) – International Agreements on Environment and Natural Resources
- Pollution Prevention and Abatement Handbook 1998
- Operational Policy: OP 4.04, Natural Habitats
- Biodiversity and Environmental Assessment Toolkit

- *OPIC Environmental Handbook;*
- *US Environmental Protection Agency (EPA):*

- Considering Ecological Processes in EIAs (Guidance in applying NEPA)
- Pollution Prevention – Environmental Impact Reduction Checklists for NEPA Reviewers (General Checklist: Habitat Preservation and Protection; Siting; and Oil and Gas Projects)

Atmospheric emissions and air quality

Standards for the protection of air quality have been derived from various sources, including the following:

- Turkish Regulation on Preservation of Air Quality
- EU standards
- World Bank standards
- World Health Organisation standards

Noise and vibration

Standards

Criteria against which predicted noise and vibration levels are assessed have been derived using relevant, recognised national (ie the Turkish Noise Control Regulation) and international guidance (eg World Bank and World Health Organisation).

Terrestrial surface water resources

The significance of any potential impact on surface water quality will depend on the present (or designated) use of the resource (eg for drinking supply, fishing, bathing) or its importance to ecology or amenity and the nature and magnitude of change caused by the Project.

The Regulation on Control of Water Pollution (RCWP) assigns ambient water quality criteria for receiving water bodies based on established water quality classifications. The four water quality classifications for inland surface waters (ie rivers, lakes and reservoirs) are as follows:

- Class I: High quality water;
- Class II: Slightly polluted water;
- Class III: Polluted water;
- Class IV: Extremely polluted water.

All regulations associated with the Turkish Environment Law will be complied.

Requirement for Preparation of an EIA Report

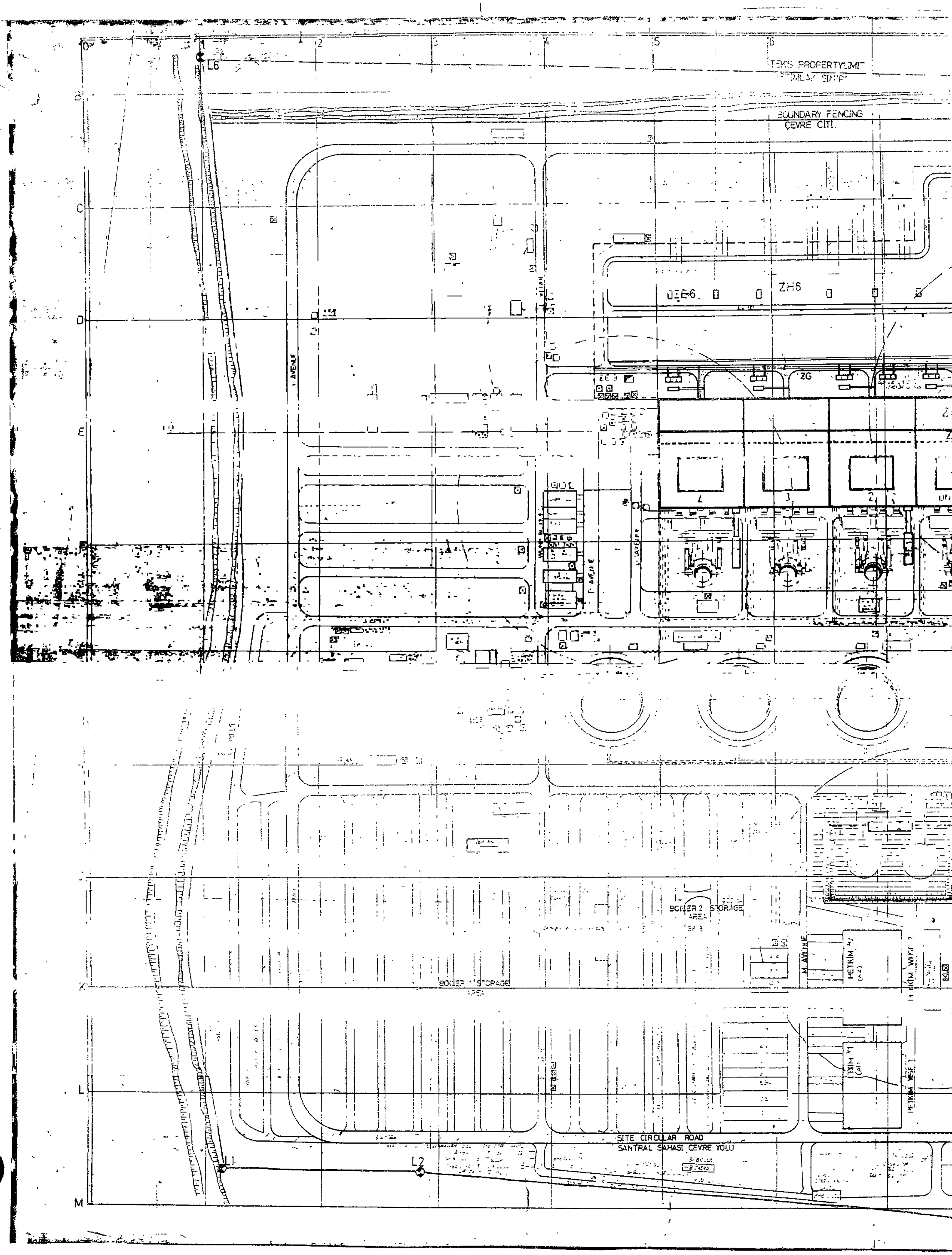
Article 10 of the Turkish Environment Law requires preparation of an EIA in order to evaluate the potential impacts on the environment that may arise from a project. The EIA has been prepared in accordance with the Turkish Environment Law after completion of a scoping study and Baseline Study.

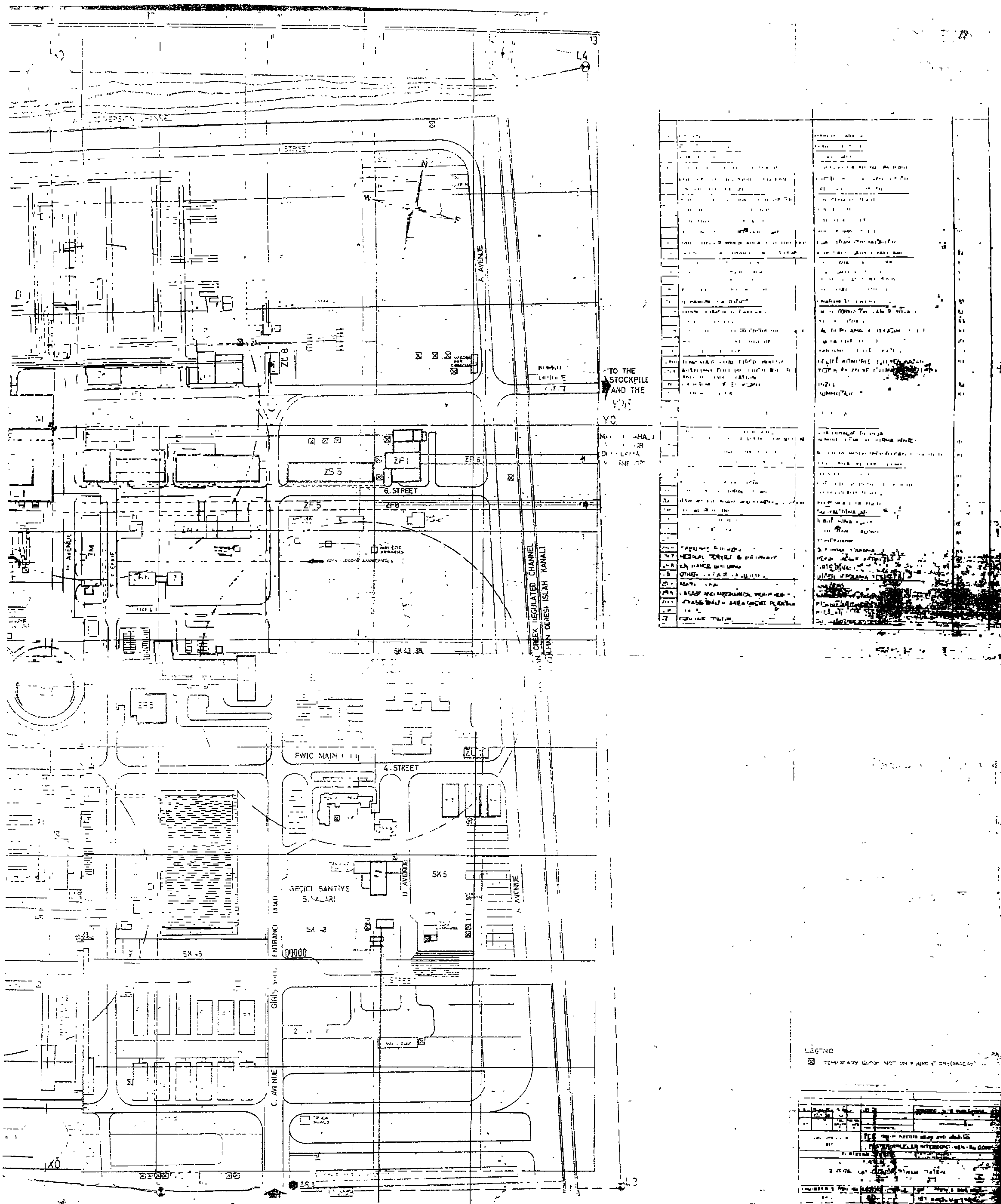
The EIA is a prerequisite for the implementation of the project and must be complete before any other permits can be issued. Moreover, the EIA must comply with World Bank Requirements.

ANNEX B

ANNEX B1

SITE LAYOUT OF AEATPP


TEKS PROPERTY LIMIT
BOUNDARY FENCING
ÇEVRE ÇİTİ
ZH6
ZG
BOILER 2 STORAGE AREA
BOILER 1 STORAGE AREA
SITE CIRCULAR ROAD
SANTRAL SAHASI ÇEVRE YOLU
L1
L2
L6
METKIM



TO THE
STOCKPILE
AND THE
YC
A. AVENUE
ZP 1
ZS 5
ZF 6
6. STREET
ZF 5
ZR 6
ZM
CREEK REGULATED CHANNEL
GÜLHAN DERESİ ISLAH KANALI
SK 43 38
ER 5
FWIC MAIN
4. STREET
SK 5
GEÇİCİ ŞANTİYE
BİNALARI
SK 8
SK 5
ENTRANCE ROAD
C. AVENUE
D. AVENUE
L4
L3
LEGEND

ANNEX B2

EIA FORMAT

AFŞİN-ELBİSTAN A TERMİK SANTRALI REHABİLİTASYON PROJESİ ÇED RAPORU FORMATI:

Başlık Sayfası

Proje sahibinin adı, adresi, telefonu, faks nosu:
Raporu hazırlayan kuruluşun adı, adresi, telefonu, faks nosu:
Projenin adı:
Raporu hazırlayan kuruluşun Yeterlik Belgesi No'su, belgenin veriliş tarihi.
Raporun hazırlanış tarihi: (Başlangıç-bitiş; Gün-Ay-Yıl)

İçindekiler Listesi:

Bölüm I: Projenin Tanımı ve Amacı (Proje konusu faaliyetin tanımı, ömrü, hizmet amaçları, ekonomik ve sosyal yönden önem ve gereklilikleri, projenin fayda-maliyet analizi)

Bölüm II: Proje İçin Seçilen Yerin Konumu (Proje yerinin mevcut arazi kullanım haritası üzerinde gösterimi, proje alanı ile ilgili temsili resimler)

Bölüm III : Projeden Etkilenecek Alanın Belirlenmesi ve Bu Alan İçerisindeki Çevresel Özelliklerin Açıklanması (**) (Projeden etkilenecek çevresel hususların tanımlanması ve bu faktörler arasındaki etkileşim)

3.1 Projeden Etkilenecek Alanın Belirlenmesi, Etkilenecek Alanın Harita Üzerinde Gösterimi
3.2. Fiziksel ve Biyolojik Çevrenin Özellikleri ve Doğal Kaynakların Kullanımı
3.2.1. Meteorolojik ve İklimsel Özellikler (Bölgenin genel ve yerel iklim koşulları, projenin bulunduğu mevkiinin topografik yapısı, sıcaklık ve yağış rejimi, bağıl nem, buharlaşma, enversiyonlu gün sayıları kararlılık durumu, rüzgar yönü ve hızı, yıllık ve mevsimlik rüzgar gülü vb.)
3.2.2. Jeolojik ve Hidrojeolojik Özellikler,
3.2.3. Toprak Özellikleri ve Kullanım Durumu (Toprak yapısı, arazi kullanım kabiliyeti sınıflaması, mera, çayır vb.),
3.2.4. Tarım Alanları (Tarımsal gelişim proje alanları, sulu ve kuru tarım arazilerinin büyüklüğü, ürün desenleri ve bunların yıllık üretim miktarları ile birim alan itibarıyla verimi, kullanılan tarım ilaçları),
3.2.5. Hidrolojik Özellikler ve Yüzeysel Su Kaynaklarının Mevcut ve Planlanan Kullanımı (Yüzeysel su kaynaklarından akarsu, göl ve diğer sulak alanların fiziksel, kimyasal, bakteriyolojik ve ekolojik özellikleri, bu kapsamda mevsimlik değişimleri,),
3.2.6. Flora ve Fauna (Türler, endemik türler, yaban hayatı türleri, ulusal ve uluslararası mevzuatla koruma altına alınan türler; nadir ve nesli tehlikeye düşmüş türler ve bunların alandaki bulunuş yerleri, bunlar için belirlenen koruma kararları; proje faaliyetlerinden etkilenecek canlılar için alınacak koruma önlemleri (inşaat ve işletme aşamasında) arazide yapılacak flora çalışmasının vejetasyon döneminde gerçekleştirilmesi ve bu dönemin belirtilmesi,
3.2.7. Madenler ve Fosil Yakıt Kaynakları (rezerv miktarları, mevcut ve planlanan işletilme durumları, yıllık üretimleri ve bunun ülke veya yerel kullanımlar için önemi ve ekonomik değerleri),
3.2.8. Devletin Yetkili Organlarının Hüküm ve Tasarrufu Altında Bulunan Araziler (Askeri Yasak Bölgeler, kamu kurum ve kuruluşlarına belirli amaçlarla tahsis edilmiş alanlar, 7/16349 sayılı Bakanlar Kurulu Kararı ile sınırlandırılmış alanlar vb.),
3.2.9. Bölgenin (hava, su, toprak ve gürültü açısından) Mevcut Kirlilik Yükünün Belirlenmesi,
3.3.10. Sağlık (Bölgede mevcut endemik ve diğer hastalıklar ve sağlık hizmetleri),
3.2.11. Diğer Özellikler

(**) Proje için seçilen yerin ve etkilenecek alanın çevresel özellikleri, yukarıda sıralanan hususlar itibarı ile açıklanırken, ilgili kamu kurum ve kuruluşlarından, araştırma kurumlarından, üniversitelerden veya benzeri diğer kurumlardan temin edilen bilgilerin hangi kurumdan ve kaynaktan alındığı raporun notlar bölümünde belirtilir (kaynaklarda yer alan literatüre metin içerisinde atıf yapılmalıdır.) veya ilgili harita, doküman vb. belgeye işlenir. Proje sahibince kendi araştırmalarına dayalı bilgiler verilmek istenirse, bunlardan kamu kurum ve kuruluşların yetkileri altında olanlar için ilgili kurum ve kuruluşlardan bu bilgilerin doğruluğunu belirten birer belge alınarak rapora eklenir.

ölüm IV : Projenin Bölüm III'te Tanımlanan Alan Üzerindeki Etkileri Ve Alınacak Önlemler
(Bu bölümde projenin fiziksel ve biyolojik çevre üzerine etkileri, bu etkileri önlemek, en aza indirmek ve iyileştirmek için alınacak yasal, idari ve teknik önlemler IV.I ve IV.2. başlıkları için ayrı ayrı ve ayrıntılı şekilde açıklanır.)

IV.1. Arazinin Hazırlanması, İnşaat ve Tesis Aşamasındaki Faaliyetler, Fiziksel ve Biyolojik Çevre Üzerine Etkileri ve Alınacak Önlemler

IV.1.1.Arazinin hazırlanması ve BGD ünitesinin inşaası için yapılacak işler kapsamında (ulaşım altyapısı dahil) nerelerde ve ne kadar alanda hafriyat yapılacağı, hafriyat artığı toprak, taş, kum vb maddelerin nereler, nasıl taşınacakları veya hangi amaçlar için kullanılacakları; kırma, öğütme, taşıma, depolama gibi toz yayıcı mekanik işlemler, tozun yayılmasına karşı alınacak önlemler,
IV.1.2.Arazinin hazırlanması sırasında ve ayrıca BGD ünitesinin inşaasında kullanılacak maddelerden parlayıcı, patlayıcı, tehlikeli ve toksik olanların temini, taşınımları, depolanmaları, hangi işlem için nasıl kullanılacakları,
IV.1.3. Proje kapsamındaki su temini sistemi ve planı, kullanılacak su miktarı, özellikleri, nereden ve nasıl temin edileceği, ortaya çıkan atık suyun miktar ve özellikleri, nasıl arıtılacağı ve nereye deşarj edileceği,
IV.1.4.Arazinin hazırlanmasından BGD ünitesinin faaliyete başlamasına ve diğer ünitelerle ilgili rehabilitasyon çalışmalarının tamamlanmasına dek sürdürülecek işler sonucu meydana gelecek katı atıkların cins ve miktarları, bu atıkların nerelere taşınacakları veya hangi amaçlar için kullanılacakları,
IV.1.5.Arazinin hazırlanmasından başlayarak BGD ünitesinin faaliyete açılması ve diğer ünitelerle ilgili rehabilitasyon çalışmalarının tamamlanmasına dek yapılacak işler nedeni ile meydana gelecek vibrasyon, gürültünün kaynakları ve seviyesi,
IV.1.6.Arazinin hazırlanmasından başlayarak BGD ünitesinin faaliyete açılmasına ve diğer ünitelerle ilgili rehabilitasyon çalışmalarının tamamlanmasına dek yapılacak işlerde kullanılacak yakıtların türleri, tüketim miktarları, oluşabilecek emisyonlar,
IV.1.7.Arazinin hazırlanmasından başlayarak BGD ünitesinin faaliyete açılmasına ve diğer ünitelerle ilgili rehabilitasyon çalışmalarının tamamlanmasına dek yerine getirilecek işlerde çalışacak personelin ve bu personele bağlı nüfusun konut ve diğer teknik/sosyal altyapı ihtiyaçlarının nerelerde ve nasıl temin edileceği,
IV.1.8.Arazinin hazırlanmasından başlayarak BGD ünitesinin faaliyete açılmasına ve diğer ünitelerle ilgili rehabilitasyon çalışmalarının tamamlanmasına dek sürdürülecek işlerden, insan sağlığı ve çevre için riskli ve tehlikeli olanlar,
IV.1.9.Diğer faaliyetler,

IV.2. Projenin İşletme Aşamasındaki Faaliyetler, Fiziksel ve Biyolojik Çevre Üzerine Etkileri ve Alınacak Önlemler

IV.2.1. Proje kapsamındaki tüm ünitelerin özellikleri, hangi faaliyetlerin hangi ünitelerde gerçekleştirileceği, kapasiteleri, proses akım şeması, temel proses parametreleri, prosesin açıklaması, faaliyet üniteleri dışındaki diğer ünitelerde sunulacak hizmetler,
IV.2.2. Proje için gerekli kireçtaşı ve diğer hammadde, yardımcı madde miktarı, kullanılacak kireçtaşı sahaları, kireçtaşının karakteristikleri, tüm hammadde ve yardımcı maddelerin taşınımları, depolanmaları, kullanılacak ulaşım tipi ve araçlar, depolama ve kırma-eleme işleminin nerede-ne şekilde gerçekleştirileceği,
IV.2.3. Proje ünitelerinde kullanılacak suyun hangi prosesler için ne miktarlarda kullanılacağı, içme ve kullanma amaçlı suların miktarı, nereden, nasıl temin edileceği, suya uygulanacak ön işlemler (arıtma birimleri ile katma-besleme suyu olarak katılacağı birimleri kapsayan), su hazırlama ana akım şeması, kullanılacak kimyasal maddeler.
IV.2.4. Kullanılacak suyun işlem sonrasında atıksu olarak fiziksel, kimyasal özellikleri, atıksu miktarları, atıksu arıtma tesislerinde bertaraf edilecek parametreler ve hangi işlemlerle ne oranda bertaraf edileceği, hangi alıcı ortamlara nasıl verileceği,

IV.2.5. Proje kapsamında kullanılacak yakıtların hangi ünitelerde ne miktarlarda yakılacağı ve kullanılacak yakma sistemleri, emisyonlar, azaltıcı önlemler ve bunların verimleri, modelleme çalışmasında kullanılan yöntem, modelin tanımı, modellemede kullanılan meteorolojik veriler (yağış, rüzgar, atmosferik kararlılık, karışım yüksekliği vb.), model girdileri, kötü durum senaryosu da dikkate alınarak model sonuçları, muhtemel ve bakiye etkiler, önerilen tedbirler, modelleme sonucunda elde edilen çıktıların arazi kullanım haritası üzerinde gösterilmesi,

IV.2.6. Tesisin faaliyeti sırasında oluşacak kül ve alçı taşının miktarı ve özellikleri, kül erime sıcaklıkları, depolama/yığma, bertaraf işlemleri, alıcı ortamlarda oluşturacağı değişimler, muhtemel ve bakiye etkiler, alınacak önlemler,

IV.2.7. Tesisin faaliyeti sırasında oluşacak diğer katı atık miktar ve özellikleri, depolama/yığma, bertarafı işlemleri,

IV.2.8. Proje kapsamında meydana gelecek vibrasyon, gürültü kaynakları ve seviyeleri, etkileri ve önerilen tedbirler,

IV.2.9. Karasal flora/fauna üzerine olası etkiler ve alınacak tedbirler,

IV.2.10. Toprak asitlenmesi, toprak asitlenmesinin tahmininde kullanılan yöntemler ve alınacak tedbirler,

IV.2.11. Projenin mevcut tarım alanlarına ve tarım ürünlerine etkileri,

IV.2.12.Yeraltı ve yüzey sularına etkiler ve alınacak tedbirler,

IV.2.13.Trafik yükü,

IV.2.14.Projenin işletme aşamasındaki faaliyetlerden insan sağlığı ve çevre açısından riskli ve tehlikeli olanlar,

IV.2.15. Projenin sosyo-ekonomik çevre üzerine etkileri ve çevresel fayda-maliyet analizi

IV.2.16. Diğer faaliyetler

Bölüm V: Projenin Alternatifleri

(Yatırımcı tarafından araştırılan ana alternatiflerin özeti ve yer seçim kriterinin gösterilmesi)

Bölüm V: Halkın Katılımı Ve Halka Projeyi Açıklama

a) Projeden etkilenmesi muhtemel yöre halkının nasıl ve hangi yöntemlerle bilgilendirildiği, proje ile ilgili halkın görüşlerinin ve konu ile ilgili açıklamalar,)

b) Projenin Teknik Olmayan Özeti

Bölüm VI: Sonuçlar

EKLER:

Ek A:

- Çevre Yönetim Planı

ÇED Olumlu Belgesinin verilmesi durumunda, Yeterlik Tebliği'nde "Yeterlik Belgesi alan kurum/kuruluşların yükümlülükleri" başlığının ikinci paragrafında yer alan hususların gerçekleştirilmesi ile ilgili program.

- Politika, yasal ve idari çerçeve

Ek B:

(Haritalar, izinler, planlar vs ve diğer gerekli dokümantasyon)

Notlar ve **kaynaklar:**

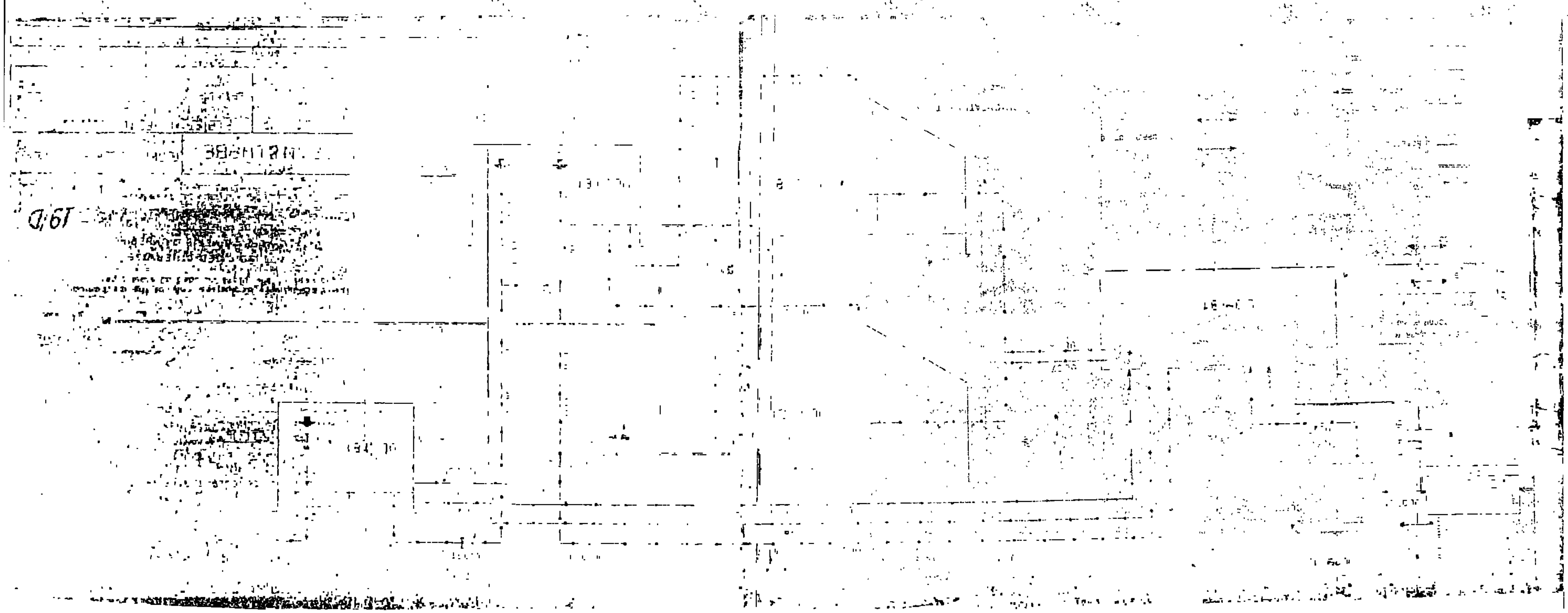
ÇED Raporunu hazırlayanların tanıtımı (Adı Soyadı, Mesleği, 1 kişi için 1 sayfayı geçmeyecek şekilde hazırlanmış kısa özgeçmiş, Referansları ve Rapordan sorumlu olduğunu belirten imzası) (bilgilenme, kapsam ve özel format belirleme toplantısında komisyon tarafından Kimya Mühendisi belirlenmiştir.)

ANNEX B3

ASH WATER TREATMENT PLANT PLAN

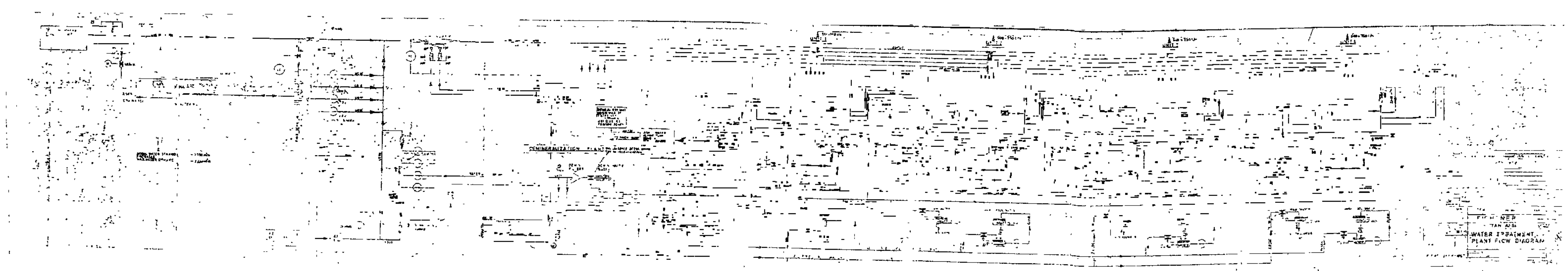
ANNEX B4

SEWAGE TREATMENT PLANT PLAN



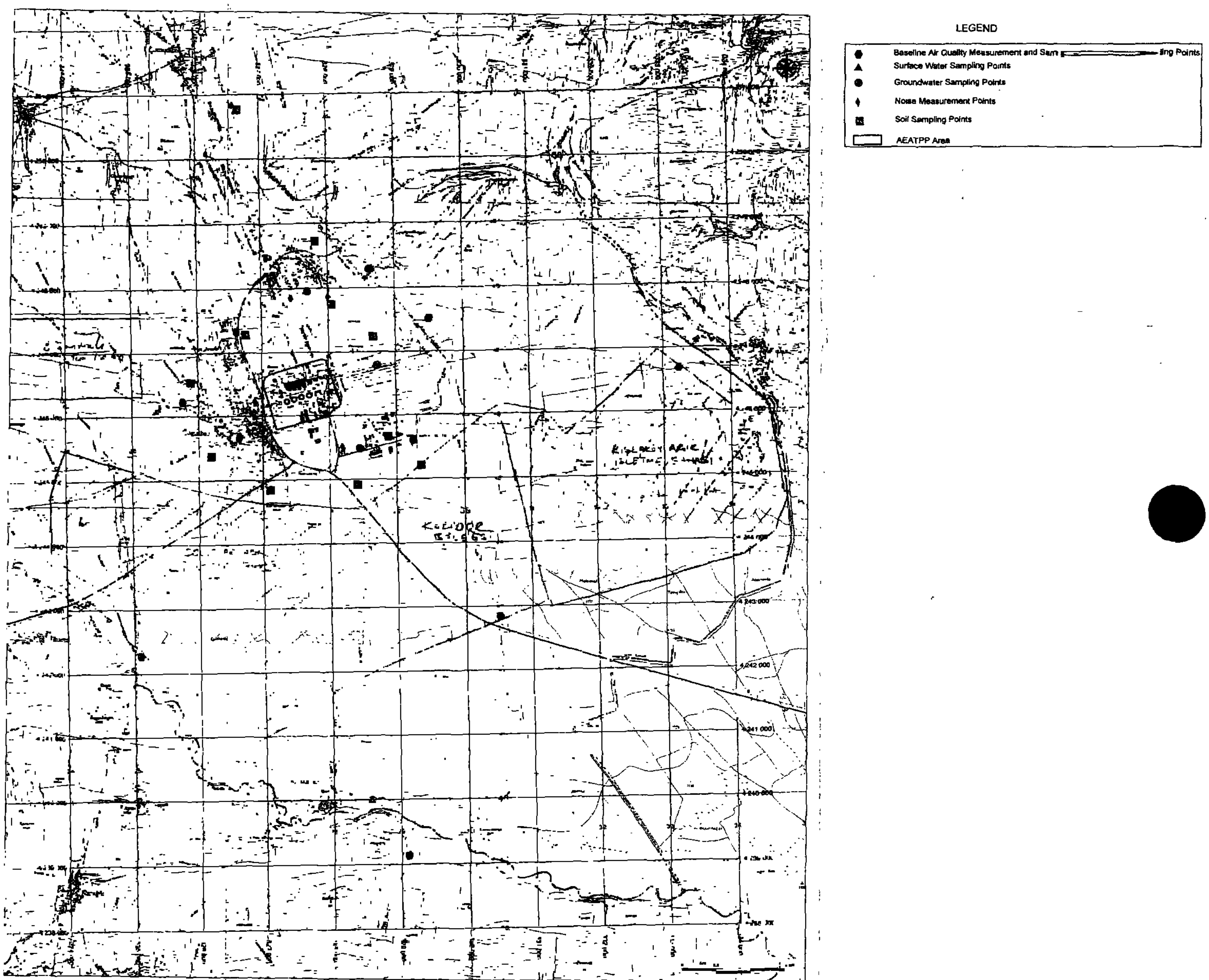
ANNEX B5

WATER TREATMENT PLANT PLAN


DEMINERALIZATION PLANT
WATER TREATMENT
PLANT FLOW DIAGRAM

ANNEX B6

BASELINE STUDIES
SAMPLING AND MEASUREMENT MAP



Map of Environmental Baseline Studies and Measurement Points

ANNEX B7

PUBLIC MEETING RECORDS

HALKIN KATILIMI TOPLANTISI T U T A N A Ğ I

İlimiz Afşin İlçesi, Çoğulhan Kasabası sınırları içerisinde kurulu bulunan Afşin-Elbistan A Termik Santralının Rehabilitasyon Projesi hakkında halkın bilgilendirilmesi, görüş ve önerilerinin alınması amacıyla yapılan Halkın Katılımı Toplantısı, Çoğulhan Kasabası Belediye Lokalinde 17 Mart 2005 tarihinde, saat 10.00 da İl Çevre ve Orman Müdürü Hüseyin ÇANAK başkanlığında yapıldı.

İl Çevre ve Orman Müdürü Hüseyin ÇANAK açılış konuşmasında toplantının amacı ve ÇED Yönetmeliği hakkında kısa bilgi verdi.

EÜAŞ Yetkilisi Yıldız GÜLER : Tesisin üretim gücü ve ortalama verimliliğindeki kayıpları önlemek için bu rehabilitasyon projesinin zorunluluğunu belirterek EÜAŞ 'ın görüşleri hakkında bilgi verdi.

Çınar Mühendislik Genel Müdürü Selahattin HACIÖMEROĞLU : Bu Projeye Dünya Bankasının'da destek verdiğini belirterek, kendi memleketi olan bölgede böyle bir hizmeti vermenin kendileri için de önemli olduğunu, Çınar Mühendislik ve Kemak İnternational B.V. Ortaklığı tarafından hazırlanacak olan ÇED Raporu doğrultusunda yapılacak proje için yörede 2 aydır bilgi toplamak için çalışmalarının devam ettiğini, halkın görüş ve önerilerini almak için Çoğulhan Kasabasında bir büro açtıklarını söyledi.

Çınar Mühendislik Personeli, Çevre Yüksek Mühendisi Özlem NADASTEPE : Proje ile ilgili hazırlamış oldukları sunu ile Proje hakkında detaylı bilgi verdi. Proje kapsamında tesisin ortalama verimliliğinin arttırılmasına yönelik çalışmalarla birlikte elektrofiltrelerin yenilenmesi ve baca gazı desülfürizasyon ünitesinin inşa edilmesinin olduğunu söyledi.

Elbistan Belediye Başkanı Abdullah PAKOY: 1985 yılında faaliyete başlayan A Termik Santralinin faaliyeti sonucu yıllardır bölgede yoğun bir hava kirliliği yaşandığını, Onkoloji Hastanesi kayıtlarına göre santral faaliyete geçmeden önce Elbistan yöresinde rastlanan kanser vakıasının 11 iken, santralin faaliyete geçmesinden sonra bu rakamın 10 kat arttığını, Elbistan Devlet Hastanesine ÜSY şikayeti ile müracaat edenlerin sayısının 5300 olduğunu, atmosfere yayılan tozların tarım arazilerini de yok ettiğini, kullanılan katma ve soğutma suyu ile de sularının ellerinden alındığını, zararı yöre halkı görürken alınan personelin de dışarıdan getirildiğini, Kar her yerde beyaz yağarken burada siyah yağdığını, daha önce kuru fasulye deposu olan bölgede fasulyenin yetişmez olduğunu, yapılan yatırımların ruhsatsız olduğunu söyledi.

Doğa Savaşçıları Örgütü Elbistan Temsilcisi Poyraz POYRAZOĞLU: Yıllarca insan yerine konulmadıklarını, yıllar sonrada olsa kendilerinin düşünülmesinin sevindirici olduğunu, 1984 yılından bu yana filtresiz çalışıldığını, bunun bölgede kanser vakıasının artışına neden olduğunu, santralden yöreye milyonlarca ton atık atıldığını söyleyerek geçmiş yıllarda yapılan toplantı vs. çalışmalardan bahsederek bir sonuç alınamadığını, santralden etkilenerek zarar gören insanların durumunu dile getirerek A Termik Santralin Rehabilitasyon Projesi tamamlanarak çevreye zarar vermeyecek önlemler alınıncaya kadar durdurulması gerektiğini söyledi.

Çoğulhan Belediye Başkanı Adem YILDIZ: Santralin olumsuz etkilerinden önceki konuşmacıların bahsettiğini belirterek, külden şikayetlerini dile getirdiklerinde kasabalarının kanalizasyon atıklarının arıtmasının dile getirilerek tehdit edildiklerini, Basın, İl Çevre ve Orman Müdürlüğünün gayretleri ve sayın Valimizin desteği ile bu aşamalara gelindiğini, sağlık olmadıktan sonra ekmeğini de istemediklerini, işçi alınırken sağlık açısından mağdur olan yöre insanlarının değerlendirilmesi gerektiğini yinede desülfürizasyon ünitesinin inşa edileceğine inanmadığını, daha önce bu projenin yapılıp biteceğinin söylendiğini ama bu güne kadar bir ilerleme görmediklerini. Çevre ve Orman Bakanlığı tarafından Projenin tamamlanacağı tarihin yazılı olarak verilmesini istediklerini, A Santralı yetkilileri ile diyalog kuramadıklarını söyledi.

Elbistan Ziraat Odası Başkanı M. Ali BULUT: Elbistan Ovasında hava kirliliği nedeniyle tarım yapamaz hale geldiklerini, bağların ve meyvelerin çoğunun kuruduğunu, santral bölgesinde 150 kg Ayçiçeği hasat edilirken,santralin etkisi dışında kalan alanlarda 300 – 350 kg Ayçiçeği alındığını, kuru fasulye deposu olan bölgede kuru fasulyeden eser kalmadığını söyledi.

Alemdar Kasabası Fatih Mahallesi Muhtarı Cafer ARSLAN: İnsanın aç ve susuz belli bir süre yaşayabileceğini, ancak havasız hiç yaşayamayacığını belirterek yörede yaşanan hava kirliliğini vurguladı.

Yöre sakinlerinden Cuma BAZ: 3 çocuğunun olduğunu ve üçünün de hasta olduğunu, birine teşhis bile konulamadığını, santralin kendilerine aş-iş vermediğini, işsiz ve hiçbir gelirinin olmadığını, evlatlarının hastalanmasının tek sebebinin santral olduğunu, mağduriyetinin giderilmesini istediğini söyledi.

Çoğulhan Kasabası sakinlerinden Mehmet ULUDAĞ : Yöre insanının hava kirliliğinden dolayı göç ettiğini, arazilerinin istimlak edildiğini, mevcut arazilerinde santralin etkisiyle verim ermediğini, iş olmadığı gibi santralin etkisiyle hastalandıklarını, yörede yaşayanların tamamının sağlık taramasından geçirilmesini talep ettiklerini söyledi.

Çoğulhan Kasabası Cumhuriyet Mahallesi Muhtarı Mevlüt SÖNMEZ: Külden çok muzdarip olduklarını, çok mağdur olduklarını, evlerinin pencerelerini açamadıklarını, bunca yıl çok çektiklerini belirterek yeter artık sabrımız kalmadı bizi bu çileden kurtarın dedi.

Çoğulhan Kasabası Turnapınar Mahallesi Muhtarı Hasan KILIÇ: Halkın %100 ünün hastalıklı olduğunu, aşın, işin olmadığını, bunlar olmadığı gibi Güneşlerinin de ellerinden alındığını, dumandan Güneşin görünmez olduğunu söyledi.

Yazıbelen Köyü Muhtarı Oğuz HURMANLI: Köyündeki Elma ağaçlarının çoğunun hava kirliliğinden dolayı kuruduğunu, kalanların da çok az ürün verdiğini, pancar vs. tarla mahsullerinden verim alamadıklarını söyledi.

Seyrantepe Mahallesi Muhtarı Hamit YILDIRIM: Santralin etkilerinden bahsetti.

Yöre sakinlerinden Durdu AKIN: Hava kirliliğinden cilt hastası olduğunu, hiçbir sosyal güvencesinin olmadığını, zararını gören yöre insanının hiç olmazsa iş imkanından yararlandırılması gerektiğini söyledi.

Yöre sakinlerinden Gülay DOĞAN: Pınarbaşı'ndan suyun önüne bent yapılarak santrale soğutma suyu alındığını, göl haline getirilen yerde aşırı yosunlanma meydana geldiğini, suyun durgunlaşması ve yosun oluşumunun suyun kalitesini olumsuz etkilediğini, Elbistan'ın içme suyunun bu kaynaktan sağlandığını, B Termik santrale de buradan su alınması durumunda şehrin içinden geçen Ceyhan Nehrinin akışının duracağını ve bir bataklık halini alacağını söyleyerek buradaki yosunlanmanın önlenmesi için alınacak önlemlerin belirlenerek projeye dahil edilmesini istiyorum dedi.

Yöre sakinlerinden Gülsen KOCA: Kanser hastası olduğunu, hastalığının sebebinin de santral olduğunu, santralden yöre insanının zarar gördüğünü söyledi.

Yöre Sakinlerinden Zekeriya SÖNMEZ: İş istediği için provokatörlükle suçlanıp hapse atıldığını, hapisten çıkınca da mahkumsun diye hiçbir yerde iş vermediklerini, kendisinin de santralın mağdurlarından olduğunu, iş istediğini söyledi.

Afşin Belediye Başkanı İrfan GEDİKBAŞI: Santral kurulmadan önce Çoğulhan'da öğretmenlik yaptığını belirterek, her nimetin bir külfetinin olacağını, ancak külfetin eziyete dönüşmemesi gerektiğini, bu sorunun 20 yıldır devam ettiğini, bu güne kadar herkesin ihmalinin olduğunu, bu gün el ele verip bunu düzeltmek için çalışmaların gerektiğini, sağlığın her şeyden önce geldiğini, sorunun çözümü için sonuna kadar elinden geleni yapacağını söyledi.

Elbistan Belediye Başkanı Abdullah PAKOY: Termik santralın ateşlemesinde çok miktarda fuel-oil ve motorin kullanıldığını, bunu yerine Botaş 'tan Doğalgaz kullanmak için herhangi bir girişimin olup olmadığını yetkililere soruyorum dedi.

EÜAŞ Yetkilisi İbrahim ÖZEN: Rehabilitasyon çalışmaları ile ilgili danışmanlık hizmeti alınacağını danışman kuruluşun yapacağı çalışmalar doğrultusunda konunun ele alınacağını söyledi.

Afşin Kaymakamı Yaşar DÖNMEZ: A Termik Santralinden kaynaklanan bir kirlilik olduğu hususunda hem fikir olunduğunu, yöre halkının 20 yıldır özverili davranarak bu duruma katlandığını, bu davranışın sürdürülmesi gerektiğini, rehabilitasyon çalışmaları tamamlanıncaya kadar bu durumun süreceğini, ancak, kirliliğin sınırları aşması durumunda tesis faaliyetinin geçici sürelerle durdurulabileceğini söyledi.

Çınar Mühendislik Genel Müdürü Selahattin HACIÖMEROĞLU : Rehabilitasyon Projesi içerisinde verim düşüklüğünün de çevresel değerlerle birlikte değerlendirileceğini, B Termik Santralinin ÇED Raporunda A Termik Santralinin Rehabilitasyonunun yer aldığını ve bunun hükümet politikası olduğunu, bu çalışmaların daha etkin bir sonuç alınmak için yapıldığını söyledi.

EÜAŞ Yetkilisi Yıldız GÜLER : Yapılan çalışmalardan bahsederek bu projenin çevreci bir proje olduğunu söyledi.

Başka görüş ve önerisi olan bulunmadığından **Toplantı Başkanı, İl Çevre ve Orman Müdürü Hüseyin ÇANAK** tarafından toplantı sona erdirildi. 17 Mart 2005

Zekeriye KÜÇÜKÖNDER
Çevre Mühendisi

Yakup KOZAK
ÇED ve Planlama Şube Müdürü

Hüseyin ÇANAK
İl Çevre ve Orman Müdürü
Toplantı Başkanı

7

T.C.
KAHRAMANMARAŞ VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

AFŞİN – ELBİSTAN A TERMİK SANTRALI REHABİLİTASYON PROJESİ
ÇED SÜRECİNE HALKIN KATILIMI TOPLANTISI KATILIM LİSTESİ

17 / 03 /2005

SIRA NO.	ADI-SOYADI	KURUMU	ÜNVANI	TEL./FAKS	İMZA
1	Hüseyin ÇANAK	İl Çevre ve Orman Müd.	İl Müdürü	234 44 24	
2	Yakup KOZAK	"	Şube Müd.	234 2099	
3	Zekeriya KÜÇÜKÖNDER	"	Çevre Müh.	0.344 234 20 99	
4	Sibel ÖZSAYIN	Çevre ve Orman Bakanlığı	Fizik Müh.	0(312) 2879963/2204	
5	Bengü SOLGUNTEKİN	"	Peyz. Mimarı	285 2910 "	
6	Yıldız GÜLER	EÜAŞ	Md. Yrd.	2126900/2432	
7	H. İbrahim ÖZEN	EÜAŞ	Müdür	2124895	
8	Gamze Köseoğlu	EÜAŞ	Teknik Şef	2126900/2435	
9	Doğan YILDIZ	EÜAŞ	Md. Yrd.	2126900/2437	
10	Ali ATMACA	EÜAŞ	Teknik Şef	2126900/2508	
11	İhsan YAZAR	EÜAŞ	Teknik Şef	2126900/2412	
12	Ilgın MIZRAK	EÜAŞ	Teknik Şef	2126900/2435	
13	Nurettin SAVRUK	EÜAŞ	T. Şef	2126930/4508	
14	Adem yıldız	Çoğulhan Bel. Bşk.	0.533 773 93 27		
15	Yaşar DÖNMEZ	Afşin Kaymakamlığı	Kaymakam	5118001	
16	Abdullah PAKSOY	ELBİSTAN BLD Bşk.		4151000	
17	İrfan GEDİKBAŞ	Afşin Bld.	Bşk.	5114660	
18	İsmail Mert	Çobanbeyli Bld.	Bşk.	523 2002	
19	Ali ÖZTURAN	Tanır Bld. Başkanı		5272002	
20	Kumber Yurdakurban	Bakış Bld. Bşk.		4362354	
21	Cengiz Merdeği	Doğan Bld. Bşk.		4212323	
22	Mete SAYA	EÜAŞ	SPTD Dai. Bşk.	0312 2124879	

T.C.
KAHRAMANMARAŞ VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

AFŞİN – ELBİSTAN A TERMİK SANTRALI REHABİLİTASYON PROJESİ
ÇED SÜRECİNE HALKIN KATILIMI TOPLANTISI KATILIM LİSTESİ

17 / 03 /2005

SIRA NO.	ADI-SOYADI	KURUMU	ÜNVANI	TEL./FAKS	İMZA
1	Ahmet Kılınç	Çoğulhan	emekli		[signature]
2	Hüseyin TERKAN	Çoğulhan	işçi		[signature]
3	Nahit Sünbül	Çoğulhan	işçi		[signature]
4	Alaattin ŞAHİN	Çoğulhan	çiftçi	5242560	[signature]
5	Ali ÇİÇEK	Çoğulhan	Emekli	5	[signature]
6	Erol Özdemir	Çoğulhan	esnaf	05436048123	[signature]
7	Cafer ARSLAN	Alandar	Muhtar		[signature]
8	Recep Kılıç	Allandar	emekli		[signature]
9	D.Mehmet çiçek	Çoğulhan	emekli		[signature]
10	M. COŞKUN	Çoğulhan	Memur		[signature]
11	Memati Korkmaz	Çoğulhan	çiftçi		[signature]
12	Enver Dinçer	Çoğulhan	Memur		[signature]
13	Cafer Ayhan	Çoğulhan	memur		[signature]
14	Ali YILAN	Elbistan	"		[signature]
15	Gülay DOĞAN	Elbistan	Avukat		[signature]
16	OĞUZ ÖZGÖREN	EÜAŞ	KİMYA TEK.		[signature]
17	Essüm ÖNER	EÜAŞ	Kimya Mühendisi		[signature]
18	Recep ÖZKAN	Esence Be	Belediye Başkanı		[signature]
19	Osman Bingöl	Çoğulhan	Çiftçi		[signature]
20	ALİ Cihan	Çoğulhan	Çiftçi		[signature]

T.C.
KAHRAMANMARAŞ VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

AFŞİN – ELBİSTAN A TERMİK SANTRALI REHABİLİTASYON PROJESİ
ÇED SÜRECİNE HALKIN KATILIMI TOPLANTISI KATILIM LİSTESİ

17 / 03 /2005

SIRA NO.	ADI-SOYADI	KURUMU	ÜNVANI	TEL./FAKS	İMZA
1	Alpar ÖZKAN	ÇOĞULHAN	Belediye		A. Özkan
2	HALİL ALDOĞAN	ÇOĞULHAN	Belediye		H. Aldoğan
3	Muarem BİNGÖL	Çoğulhan	Muhtar		
4	Fikri Yıldız	Çoğulhan Kurtuluş Mah.	Esnaf		
5	Ömer POLAT	ÇOĞULHAN Seyrantepe Mah.	Makina Tekn.		
6	Mehmet POLAT	ÇOĞULHAN Seyrantepe Mah.	Çiftçi		
7	Murat ÖZER	Çoğulhan Cumhuriyet	İŞÇİ		
8	Harun YILDIZ	Çoğulhan Turnapınar	İşçi		
9	Hanifi yıldız	çoğulhan	çiftçi		
10	Selahattin polat	Çoğulhan K.S	Emekli		
11	Halil dinçe	Çoğulhan K.S	Emekli		
12	Levent Yılmaz	Çoğulhan	–		
13	Cuma özdemir	Çoğulhan			
14	Hasan özdemir	Çoğulhan	işsiz		
15	mehmet yanık	Çoğulhan K.	işi yok		
16	Mehmet Zencirbıra	//	//		
17	Turan KAZ	\\	işi yok		
18	Hüseyin Çankal	"	işi yok		
19	Yusuf Şahin	"	işi yok		
20	İsmail yıldız	\\	işi yok		

T.C.
KAHRAMANMARAŞ VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

AFŞİN – ELBİSTAN A TERMİK SANTRALI REHABİLİTASYON PROJESİ
ÇED SÜRECİNE HALKIN KATILIMI TOPLANTISI KATILIM LİSTESİ

17 / 03 /2005

SIRA NO.	ADI-SOYADI	KURUMU	ÜNVANI	TEL./FAKS	İMZA
1	Hüseyin Kılınç	Alemdar	Emekli		
2	Nuh Kılınç	Alemdar	Muhtar	539-1039	
3	Serkan Şahin	Çoğulhan	işsiz		
4	Bünyamin Şahin	〃	işsiz		
5	Hacı Şahin	〃	işsiz		
6	İbrahim Şahin	〃	işsiz		
7	İbrahim Zencirkıran	〃	işsiz		
8	Hasan Zencirkıran	〃	işsiz		
9	Ferhat Polat	〃	işsiz		
10	Cuma Polat	〃	işsiz		
11	İsmail Polat	〃	işsiz		
12	Kaddafi Polat	〃	işsiz		
13	[illegible] Gök				
14	Tahsin	Hilal			
15	İbrahim	Gaz			
16	Yakup	Tekdemir	muhtar.		
17	Ali ŞAHİN	EMEKLİ			
18	Mikail Sünbül	Emekli		524 2378	
19	Mehmet Uludağ	〃	işçi	524 2117	
20	Musa Genç	〃	Muhtar	5272464	

Adı Soyadı	Kurumu	Ünvanı	Tel./Faks	İmza
Fevzi Akbulut	~~muhtar~~	çiftçi		
Ahmet İçöz				
Hasan Kılınç	muhtar			
Bayram Korkmaz				
Ahmet Alsın				
Halit Yıldız				
Mevlüt Sönmez	muhtar			
Yasin Hilal				
Ramazan İçöz				
Sefer Yurık				
Yazıbelenköyü muhtarı				
Oğuz Durmanlı				
Mehmet Ayhan				
İhtiyar heyeti				
Zekin Bayraz				
Sacit Ekici				
Hamit Yıldırım				

Adı. Soyadı	Kurumu	Ünvanı	Tel./faks	İmza
Hamza Sönmez Dağlıca		Emekli memur	0344 ~~514187~~ 718	
Abdullah Çiçek		öğrenci		
Ayşe Kurtcephe		Öğrenci		
Hacer Koç		öğrenci		
Muharrem Kılınç		E. Memur		
Halil Binbuğa		Çiftçi		
Mehmet Ali Bulut		E. Z. O. Baş		
Hasan Ağger	Bizim elbistan Gazetesi	İnşaat Mühendisi		
Ahmet Güler	Ekon			
Poyraz Poyrazoğlu		inşaat müh. ~~garre~~ öğretim üyesi		
Selçuk Köseebalaban	Yeşil Afşin Gazetesi			
Ömer Köseebalaban	Yeşil Afşin Gazetesi (İktisatçı)			
Mehmet Kara	Camlıpınar	Çiftçi		
Rıza Genç	İnci Köyü			

7-

Adı Soyadı	Kurumu	Ünvanı	Tel-Faks	İmza
Sedat Soyuçepri	Bizim Elbistan Gazetesi	Muhabir.	4150776	
Alper Özcan	Afşin Elbistan B. Santrali.	İşl. Müdürü	4154717	
İsmet Narin	Best TV.	Y. Kurulu başkanı	4150101. 4150102 fax.	
Nurettin Köker	Ticaret odası	2. başkan	4135545	
Arif ŞAHİN	B. Santrali,	Md. yrd.	524 25 13	
Nihal KONAN	B Santrali	Avukat	5242899	
Özlem NADAŞTEPE	Çınar Mühendislik	Çevre Y. Mühendisi	03124723839	
Selahattin HACIÖMEROĞLU	"	Genel Müdür	"	
Mustafa ŞAHİN	"	Çevre Mühendisi	"	
Afşin GÖZEN	"	Kalite Yöneticisi	"	
Muhittin İKİNCİ	"	Teknisyen	"	

7

T.C.
Çevre ve Orman
Bakanlığı

T.C.
KAHRAMANMARAŞ VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

Sayı : B.18.4.İÇO 6.46.00.03/ 69 /534 09./03/2005
Konu : ÇED Sürecine Halkın Katılım Toplantısı.

AFŞİN KAYMAKAMLIĞINA

İlgi : Valilik Makamının 08.03.2005 tarih ve 60/60 sayılı olurları.

İlçeniz Çoğulhan Beldesi sınırları içerisinde faaliyet gösteren Afşin – Elbistan A Termik Santralinin Rehabilitasyon Projesi hakkında Çevresel Etki Değerlendirmesi (ÇED) Yönetmeliğinin 9. maddesi gereğince yapılması gereken "ÇED Sürecine Halkın Katılımı Toplantısı"nın 17 Mart 2005 tarihinde saat 10.00'da, Çoğulhan Belediyesi Lokalinde İl Çevre ve Orman Müdürü Hüseyin ÇANAK başkanlığında yapılması hususundaki ilgi olurun bir sureti yazımız ekinde gönderilmiştir.

Söz konusu toplantının ilçeniz merkez ve bağlı beldelerde ilan edilmesi, ilçenizde bulunan sivil toplum kuruluşları ile yazılı ve görsel basına duyurularak ilgi duyanların katılımının sağlanması ve toplantının güvenliği için gereğini rica ederim.

Ahmet OKUR
Vali a.
Vali Yardımcısı

EKİ :
- Olur sureti.(1 syf.)

08.03.2005	Memur	H.AVAN
08.03.2005	Şube Müd.	Y.KOZAK
09..03.2005	İl Müdürü	H.ÇANAK

7

T.C.
Çevre ve Orman
Bakanlığı

T.C.
KAHRAMANMARAŞ VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

Sayı : B.18.4.İÇO 6.46.00.03/ 70 /532 | 09../03/2005
Konu : ÇED Sürecine Halkın Katılım Toplantısı.

ELBİSTAN KAYMAKAMLIĞINA

İlgi : Valilik Makamının 08.03.2005 tarih ve 60/60 sayılı olurları.

İlimiz Afşin İlçesi Çoğulhan Beldesi sınırları içerisinde faaliyet gösteren Afşin – Elbistan A Termik Santralinin Rehabilitasyon Projesi hakkında Çevresel Etki Değerlendirmesi (ÇED) Yönetmeliğinin 9. maddesi gereğince yapılması gereken "ÇED Sürecine Halkın Katılımı Toplantısı"nın 17 Mart 2005 tarihinde saat 10.00'da, Çoğulhan Belediyesi Lokalinde İl Çevre ve Orman Müdürü Hüseyin ÇANAK başkanlığında yapılması hususundaki ilgi olurun bir sureti yazımız ekinde gönderilmiştir.

Söz konusu toplantının ilçeniz merkez ve bağlı beldelerde ilan edilmesi, ilçenizde bulunan sivil toplum kuruluşları, yazılı ve görsel basına ve Elbistan Şeker Fabrikası Müdürlüğüne duyurularak ilgi duyanların katılımının sağlanması hususunda gereğini rica ederim.

Ahmet OKUR
Vali a.
Vali Yardımcısı

EKİ :
- Olur sureti.(1 syf.)

08.03.2005	Memur	H.AVAN
08.03.2005	Şube Müd.	Y.KOZAK
09..03.2005	İl Müdürü	H.ÇANAK

T.C.
Çevre ve Orman
Bakanlığı

T.C.
KAHRAMANMARAŞ VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

Sayı : B.18.4.İÇO 6.46.00.03/ 68/533 09../03/2005
Konu : ÇED Sürecine Halkın Katılım Toplantısı.

....

İlgi : Valilik Makamının 08.03.2005 tarih ve 60/60 sayılı olurları.

İlimiz Afşin İlçesi Çoğulhan Beldesi sınırları içerisinde faaliyet gösteren Afşin – Elbistan A Termik Santralinin Rehabilitasyon Projesi hakkında Çevresel Etki Değerlendirmesi (ÇED) Yönetmeliğinin 9. maddesi gereğince yapılması gereken "ÇED Sürecine Halkın Katılımı Toplantısı"nın 17 Mart 2005 tarihinde saat 10.00'da, Çoğulhan Belediyesi Lokalinde İl Çevre ve Orman Müdürü Hüseyin ÇANAK başkanlığında yapılması hususundaki ilgi olurun bir sureti yazımız ekinde gönderilmiştir.

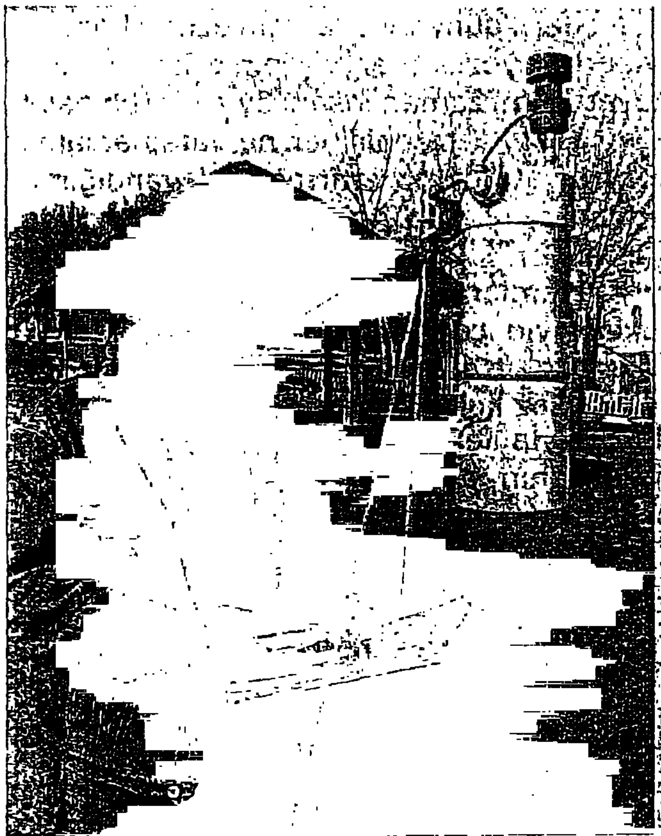
Söz konusu toplantıya ilçenizden ilgi duyanların katılımının sağlanması hususunda gereğini rica ederim.

Ahmet OKUR
Vali a.
Vali Yardımcısı

EKİ :
- Olur sureti.(1 syf.)

DAĞITIM :
Ekinözü Kaymakamlığına
Göksun Kaymakamlığına
Nurhak Kaymakamlığına

08.03.2005	Memur	H.AVAN
08.03.2005	Şube Müd.	Y.KOZAK
09.03.2005	İl Müdürü	H.ÇANAK



A Termik'in ÇED toplantısı 17 Mart'ta

☑ *Afşin-Elbistan A Termik Santralı'nın rehabilitasyonu ve Baca Gazı Arıtma Ünitesinin tesis edilmesi amacıyla yaklaşık 1 aydan beri çalışmalarını sürdüren Çınar Mühendislik, ÇED yönetmeliğinin 9. maddesi gereğince halkı yatırım hakkında bilgilendirecek. Halkın Katılımı Toplantısı, 17 Mart 2005 günü saat 10.00'da Çoğulhan Belediye Lokali'nde yapılacak. Toplantıya yöre halkı ve tüm sivil toplum örgütleri davet edildi.*

HABERİ 4'TE

T.C.
Çevre ve Orman
Bakanlığı

T.C.
KAHRAMANMARAŞ VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

Sayı : B.18.4.İÇO 6.46.00.03/ 60 /60 **08/03/2005**
Konu : ÇED Sürecine Halkın Katılım Toplantısı.

VALİLİK MAKAMINA
KAHRAMANMARAŞ

İlgi : Bakanlığımız ÇED ve Planlama Genel Müdürlüğünün bila tarih ve 1127 sayılı (fax) yazısı.

İlimiz Afşin İlçesi sınırları içerisinde faaliyet gösteren Afşin – Elbistan A Termik Santralin Rehabilitasyon Projesine ilişkin ÇED sürecinin başladığı, yönetmeliğin 9. maddesi gereğince yapılması gereken "ÇED Sürecine Halkın Katılımı Toplantısı"nın 17 Mart 2005 tarihinde düzenlenmesi gerektiği ilgi yazıda bildirilmektedir.

Söz konusu toplantının 17 Mart 2005 tarihinde, saat 10.00'da, Çoğulhan Belediyesi Lokalinde İl Çevre ve Orman Müdürü Hüseyin ÇANAK başkanlığında yapılmasını olurlarınıza arz ederim.

Hüseyin ÇANAK
İl Çevre ve Orman Müdürü

OLUR
07/03/2005
Ahmet OKUR
Vali a.
Vali Yardımcısı

İnsanlarımızdan Sorumluyuz!

Afşin Elbistan Termik Santrali ... rehabilitasyonu ... gaz desülfirizasyon tesisi ... edilmesi ile ilgili halk toplantısı Çoğulhan Belediyesi'nde yapıldı.

Santralin rehabilitasyonu projesi ... önce tesisin elektrostatik filtreleri ile birlikte rehabilitasyonu ... daha sonra Baca Gazı Desülfürizasyon tesisinin kurulmasını kapsıyor. Proje ile santralin verimliliğinin ... ömrünün uzatılması ve tesisten kaynaklanan emisyonların Endüstriden Kaynaklanan Hava Kirliliği Yönetmeliği ... değerlerinin altına düşürülerek ... olumsuz çevresel etkilerin önlenmesi amaçlanıyor. Çoğulhan Belediye Başkanı Adem Yıldız'ın ev sahipliği yaptığı toplantıya Kahramanmaraş Çevre Orman İl Müdürü Hüseyin Çanak, EÜAŞ yetkilileri, Afşin Kaymakamı Yaşar Dönmez, Afşin Belediye Başkanı İrfan Gedikoğlu, Elbistan Belediye Başkanı Abdullah Paksoy ile belde belediye başkanları, rehabilitasyon projesiyle ilgili müşavir firma Çınar Mühendislik sahibi Selahattin Hacıömeroğlu ve firma yetkilileri, bölgedeki köy ve mahalle muhtarları ile Çoğulhan halkı katıldı.

Toplantıda ilk konuşmayı Kahramanmaraş Çevre Orman İl Müdürü Hüseyin Çanak yaptı. 1984 yılında faaliyete başlayan santralin yöreye iş ve aş sağladığını söyleyen Çanak, "Elbette 21 yılda bir takım problemler meydana gelmiştir. Her şeyden önemlisi santral ... Bizim ... çalışmalarımız ... kaynaklanan problemleri giderme yönünde olacaktır." dedi.

Daha sonra söz alan EÜAŞ temsilcisi Yıldız Gülar da bu projenin çevresel sorunların en aza indirilmesi için hizmet ...

"Veraceğimiz ... söyleyerek, "Buradaki bütün çalışmalarımız halk için olacak ... proje çevreci bir projedir ve yüksek performans sağlanması planlanmaktadır. Toplantının amacı da bu halkın görüşlerinin ... tespit edilmesidir." dedi.

Selahattin Hacıömeroğlu: "Afşin'e hizmet etmekten mutluluk duyuyorum"

Projenin müşavirliğini yapan Çınar Mühendislik adına konuşma yapan Afşinli bürokratlardan Selahattin Hacıömeroğlu da söz alarak şunları söyledi:

"Ben bu santral yapıldığında Afşin'de bürokratdım. Şimdi böyle bir projede Afşin'e hizmet etmekten dolayı çok mutluyum. Bu konuyla ilgili bugüne kadar yapılmış en kapsamlı toplantıyı gerçekleştiriyoruz ... birlikte ..."

EÜAŞ ve Çevre Bakanlığı'ndan kurdukları ... Nadaştepe ... "Yaptığımız ... Çevresel Etki Değerlendirme (ÇED) raporu ... projelerin ... belirlendi ..."

Hacıömeroğlu, görüşlerini almak için Çoğulhanlıları beklediklerini söyledi.

Konuyla ilgili slayt sunumu yapan Çınar Mühendislik ve Müşavirlik firması Çevre Mühendisi ... Nadaştepe'de projeyi anlattı. Zaman içinde meydana gelen eskimeden dolayı santralde verim düşüklüğü yaşandığını ... getiren Nadaştepe projelerinin amacının da ... önlemek olduğunu söyledi.

Çoğulhan'ın çeşitli yerlerinde havayı ...

Yapılan konuşmaların ardından ... sorulara geçildi. Elbistan Belediye Başkanı Abdullah Paksoy, santralin ... yörenin havasını, suyunu ve toprağını kullanılamaz hale getirdiğini dile getiren Paksoy, "Elbistan Devlet Hastanesi'ne şu ana kadar 5300 kişi ... kanser vakaları ..."

Yeşil Afşin

GÜNLÜK SİYASİ BAĞIMSIZ MAHALLİ GAZETE — KURULUŞ: 1983

DUYURU

Elektrik Üretim A.Ş. (EÜAŞ) Genel Müdürlüğü tarafından işletilmekte olan Afşin Elbistan A Termik Santralının Rehabilitasyonu ve Baca Gazı Desülfürizasyonu Ünitesi Tesis Edilmesi Projesi için ÇED Yönetmeliğinin 9. maddesi gereğince halkı yatırım hakkında bilgilendirmek, projeye ilişkin görüş ve önerileri almak üzere aşağıda tarihi ve saati verilen yerde "Halkın Katılım Toplantısı" yapılacaktır.

Halkımıza saygı ile duyurulur.

Toplantı Tarihi : 17/03/2005

Toplantı Yeri : Çoğulhan Belediye Lokali Çoğulhan/ Afşin

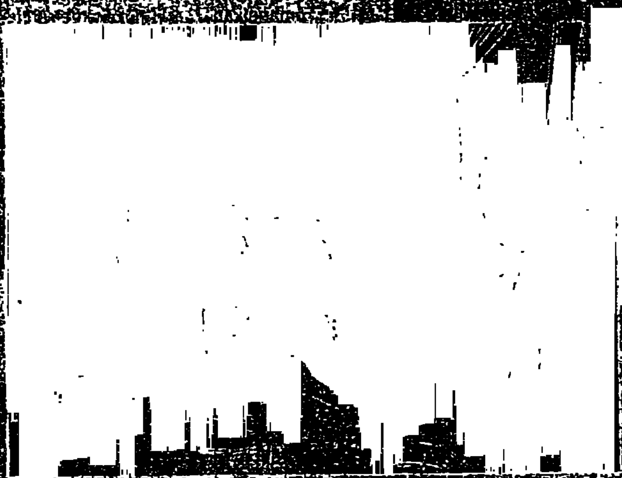
Toplantı Saati : 10:00

Faaliyet Sahibi:
Elektrik Üretim A.Ş.
Tel : 0 (312) 212 78 64
Faks: 0 (312) 222 82 68

ÇED Raporunu Hazırlayan Kuruluş:
Çınar Mühendislik Müşavirlik ve Proje Hizmetleri Ltd. Şti.
Tel : 0 (312) 472 38 39
Faks: 0 (312) 472 39 33
web : www.cinarmuhendislik.com

KEMA International B.V.
Tel: +31 26 3 56 63 10
Faks: +31 26 3 89 24 77
web: www.kema.com

İnsanlarımızdan Sorumluyuz!....



Türkiye
10 MART 2005 PERŞEMBE
Fiyatı: 30 YKr (300.000 TL)
internet adresi: www.turkiyegazetesi.com
GÜNLÜK SİYASİ GAZETE
0 212 454 30 00

DUYURU

Elektrik Üretim A.Ş. (EÜAŞ) Genel Müdürlüğü tarafından işletilmekte olan Afşin - Elbistan A Termik Santralı'nın Rehabilitasyonu ve Baca Gazı Desülfürizasyonu Ünitesi Tesis Edilmesi Projesi için ÇED Yönetmeliği'nin 9. maddesi gereğince halkı yatırım hakkında bilgilendirmek, projeye ilişkin görüş ve önerilerini almak üzere aşağıda tarihi ve saati verilen yerde Halkın Katılım Toplantısı yapılacaktır.

Halkımıza saygı ile duyurulur.

Toplantının Tarihi : 17.03.2005
Toplantının Yeri : Çoğulhan Belediye Lokali Çoğulhan / Afşin
Toplantı Saati : 10.00

Faaliyet Sahibi:
Elektrik Üretim A.Ş.
Tel: 0 (312) 212 78 61
Faks: 0 (312) 222 82 58

ÇED Raporunu Hazırlayan Kuruluş:
Çınar Mühendislik Müş. ve Proje Hizmetleri Ltd. Şti.
Tel: 0 (312) 472 38 39 Faks: 0 (312) 472 09 33
Web: www.cinarmuhendislik.com
KEMA International B.V.
Tel: +31 26 3 56 63 10 Faks: 31 26 3 89 24 77
Web: www.kema.com

HABER ELBİSTAN
GÜNLÜK BAĞIMSIZ GAZETE
Elbistan, Afşin, Göksun, Nurhak ve Ekinözü Bölge Haberleri
10 Mart 2005
Perşembe
Yıl:3 Sayı:698
10 YKr / 100.000 TL
Tel.:415 40 40 - 41

DUYURU

Elektrik Üretim A.Ş. (EÜAŞ) Genel Müdürlüğü tarafından işletilmekte olan Afşin-Elbistan A Termik Santralinin Rehabilitasyonu ve Baca Gazı Desülfürizasyonu Ünitesi Tesis Edilmesi Projesi için ÇED Yönetmeliğinin 9. maddesi gereğince halkı yatırım hakkında bilgilendirmek, projeye ilişkin görüş ve önerileri almak üzere aşağıda tarihi ve saati verilen yerde "Halkın Katılımı Toplantısı" yapılacaktır.

Halkımıza saygı ile duyurulur.

Toplantı Tarihi : 17/03/2005

Toplantı Yeri : Çoğulhan Belediye Lokali Çoğulhan/Afşin

Toplantı Saati : 10:00

Faaliyet Sahibi :Elektrik Üretim A.Ş.
Tel:0 312 212 78 61
Faks:0 312 222 82 58

ÇED Raporunu Hazırlayan Kuruluş:
Çınar Mühendislik Müşavirlik ve Proje Hizmetleri Ltd. Şti.
Tel:0 312 472 38 39
Faks: 0 312 472 39 33

Kemal International B.V.
Tel:+31 26 3 56 63 10 Faks:+31 26 3 89 24 77
web:www.kema.com

21.08.2005

[illegible] handa yapılmış olan ÇED toplantısına katıldım
[illegible] lerim raporda yer almıştır

Rifat Yıldız
Avukat

[illegible] ilhanda yapılmış olan ÇED toplantısına
[illegible] ım ve görüşleri raporda yer almıştır

Mahmut YILDIZ
ISGI

[illegible] mızda yapılmış olan ÇED Toplantısına iştirak
[illegible] görüşlerim raporda yer almıştır.

Tamer YILMAZ

ÇED toplantısına katıldım ve görüşlerim
ÇED raporunda yer almıştır.
Mehmet BİÇİCİ

[illegible] da yapılan ÇED toplantısına katıldım görüşlerim
[illegible] yer almıştır.

Nevzat YILDIZ

21.08.2005

...oğulhanda yapılan ÇED toplantısına katıldım
...şarım projede yer almıştır.

Erdal Sümbül
Belediye Personeli

ÇED toplantısına katıldım görüşlerim projede
...er almıştır.

Mecit Zincirbıra
Bld. Personeli

...evresel Etki Değerlendirme toplantısına
...a ...ve görüşlerim raporda yer almıştır.

Yasin YILMAZ
Bld. Personeli

...oğulhanda yapılan ÇED toplantılara
...dım ve görüşlerim raporda yer almıştır.

Civan GÖKHAN
Bld. Personeli

ÇED toplantısına katıldım ve görüşlerim raporda
yer almıştır. Tşk. ederim.

Cuma Etici
Bel Personeli

20.05.2005

Çoğulhan'da yapılmış olan CED Toplantısına katıldım ve görüşlerim
perde yer almıştır. Teşekkür ederim

Mehmet Elici
İşsiz

-. marta. Çoğulhanda yapılmış olan ced toplantısına
katıldım ve görüşlerim CED. Raporunda yer almıştır.

Öner ARSLAN

Çoğulhanda yapılmış olan ÇED
toplantısına katıldım ve görüşlerim
raporda yer almıştır Hakan Kılınç

-mart'ta Çoğulhan'da yapılmış olan ced top
lantısına katıldım ve görüşlerim raporda yer
almıştır = Mustafa POLAT =

Belediye İşçisi =

Çoğulhanda yapılmış olan CED toplantısına katıldım ve
görüşlerim raporda yer almıştır. Recep AKDAĞ

Belediye personeli. R.

Çoğulhan kasabasında yapılan ÇED toplantısı
na katıldım ve görüşlerim projede yer almıştır,
teşekkür ederim
Cuma ASLAN

.20.08.2005

...işyurhanı'da yapılmış olan GED toplantısına katıldım ve görüşlerim raporda yer almıştır.

Durmuş KILINÇ

M.T.A. Çalışanı

...handa yapılmış olan GED Toplantısına katıldım ve görüşlerim raporda yer almıştır

Baykal GÖZÜKARA

Polis M.Y.O

...ınar Mühendisliğin yaptığı GED toplan...a katıldım ve görüşlerim raporda yer ... için teşekkür ederim.

Selçuk ÇOBAN

Üni. Öğrencisi

...nın'da yapılmış olan GED Toplantısına katıldım ve ...n proje ve raporda yer almıştır ilginize teşekkür

Serdar KOCA

Bilgisayar Teknikeri

19.06.2005

[illegible] yapılmış olan Çevresel etki değerlendir[illegible]
[illegible] toplantısına katıldım. ve görüşlerim projede
[illegible]mıştır. Saygılarımı Sunarım.

Ömer Sönmez

[illegible] yapılmış olan halk toplantısına katıldım ve
[illegible] projede yer almıştır

Uğur BERİK

[illegible] Çınar mühendisliğin yapmış
[illegible] halk toplantısına katıldım ve
[illegible]im projede yer almıştır.

Emre Akbulut
Öğrenci

[illegible] tarihinde yapılan GED toplantısına
[illegible] ve görüşlerimiz GED raporunda yer

Hacı Veli KILINÇ

19.05.2005

Çoğulhanda Çevre mühendislerinin yaptığı halk toplantısına katıldım ve görüşlerimi sundum Görüşlerimi projede yayınladığınız için teşekkür ederim

Çiftçi
Ramazan Kılınç

Çoğulhanda yapılan halk toplantısına katıldım ve görüşlerim projede yer almıştır.

Hakan KILIÇ

Çınar mühendisliğin çoğulhanda yapmış olduğu halk toplantısına katıldım ve görüşlerimi projede yayınladıkları için teşekkür ederim.

Çiftçi
Soner ASLAN

Çoğulhanda yapılmış olan halk toplantısına katıldım ve görüşlerim projede yer almıştır.
Çiftçi
Aziz Bingöl

19.08.2005

17 Mart 2005 tarihinde Çınar Mühendisliğin yaptığı halk toplantısına katıldım ve görüşlerimin projeden yer almasından dolayı teşekkür ederim

Muhammet KILINÇ

Çınar Mühendisliğinin halk toplantısına katıldım ve görüşlerim projede yer verilmiştir.

İsmail Çetin

17 mart 2005 tarihinde yapılan çınar mühendisliğin yaptığı halk toplantısına katıldım ve görüşlerimin projede yer verdikleri için teşekkür ederim

oğuzhan Yıldız
Belediye işçisi

17 Martta Yapılan halk toplantısında verdiğim görüşler projede yer almıştır

Çağılhan
Berberi Yakup Sarı

E. Tuğrul ŞAHİN
B. ünitesi Çalışanı

Tarih: 19.08.2005

Öncelikle böyle bir projeye imza attığınız için size minnattar kaldım. Gelelim esas konuya hava kirliliğine yaklaşık 30 senedir bu insanlar bu havayı soluyorlar ve bu 30 senedir kimsenin sesi çıkmadı çıkmadığı gibide hiç bir zaman hava kirliliğine çare bulamadılar. Bu saatten sonrada kimsenin hiç bir çare bulacağınıda sanmıyorum. En güzel çare buranın halkı yüzde 90 işsiz. Siz hava kirliliğine çare bulamazsınız bundan çok eminim siz en iyisi işsizliğe çare bulursanda bu insanlar hiç bari hasta oldukları zaman güzel bir tedavi olsunlar. Ben elektro filitre montaj ustasıyım. Siz A. B. binakında +B. santralı sıfır km. şimdi gidinde oraya çare bulmaya bakın. İşiniz yoksa gelin bunaya bunlarla uğraşın.

Yinede böyle bir projeye imza attığınız için size sonsuz teşekkürlerimi sunarım.

Saygılarımla

Ertuğrul ŞAHİN

Mustafa Bilici 18.08.2005

Esnaf

Projeye biraz göz attım. Halkın görüşlerinde yer vermeniz beni mutlu etti. Hastalıklar içinde yaşadığımız bu yerde bizimle beraber aynı duyguları paylaşmanız sevindirici. İnşallah umutlarımızı kırmazsınız. Bunu A termik santralında ve B termik Santralinde uygulayabilirseniz memnun oluruz. Çünkü yeni yapılan B santralide geceleri gizliden kül bırakıyor. Buna bizzat şahidim bu konuyuda gündeme getirirseniz çok sevinirim. Bu çalışmaları yaptığınız için minnettarız.

Mustafa Bilici

Muhammet KILINÇ
Ünüversite Öğrencisi

DATE 18.08.2005

Bu projeyi ve raporu biz çoğulhan halkıyla paylaştığınız için ve görüşlerimize yer verdiğiniz için çoğulhan halkı adına teşekkür ederim.

A.E.A.T.S ile beraber büyüdüm fakat bugüne kadar ciddi bir ne çalışma nede ilgi gördüm. Hiç bişey yapamasanız bile yani bu şirket yöneticilerine filtreyi taktıramasanız bile, bu çalışma ve ilgi biz çoğulhana umut verici ve bizleride düşünen kuruluşlar olacağını bilmek güzel. Biz zaten kül balasından, sebze ve meyvalardaki çeşitli gazlardan, tortulardan biraz olsun bağışıklık kazandık. Yalnız şunu söylemek istiyorum Bütün Çoğulhan halkı bir araya gelse ne böyle proje ne bir ses, ne de kendini duyurabilir. Sizlere ne kadar teşekkür etsek azdır.

Yaptığınız bu çalışma, inşallah sonucunu verir ve amacına ulaşır. Çoğulhanın sesini daha yükseklere duyurmanız bizi dahada memnun edecektir. Sadece burda yaşayanları, kendiniz yerine koymanızı diliyorum. Sizden başka dert yanacağımız kimse olmadı. Allah razı olsun diyorum.

Saygılarımla

... Polat
...iye görevlisi

15.08.2005

Rapora biraz göz atıp projeyi inceledim ve
...n güzel birşey olduğunu anladım. Bu projeyi
...ığınız için çok teşekkür ederim. Bizi bu külden
...urmanızı diliyorum. Yemek bile yiyemez olduk,
... işçi elbisede yaşamıyoruz., Sizin Çoğulhan'la
...enmenizden çok memnunuz. inşallah bu dediğiniz
... filtreyi kullanıma açtırırsınız. Çok şey
..., şey var ama eminim sizlerde en az
... kadar anlamışsınızdır durumu. Çalışmalarınız
... devamını diliyor yolunuz açık olsun diyorum.

Saygılarımla

...KILINÇ
...TA İşçisi

17.08.2005

Sen bu projeyi okurken çok şaşırdım. Böyle
projeyi hazırlamak çok güzel bir şey ama
projenin gerçekleşeceğine pek inanmıyorum. Ama
bir şeyin yapılması Çoğulhan için umut verici
olaydı. Yapılmasada bişey farketmez çünkü biz
kokuya alışmışız. Ama elimizden bişey gelmiyor
yerinde elinden gelmeyeceğini düşünüyorum. Bunu
...han halkı olarak göreceğiz. İnşallah bizleri
...ıtırsınız. Ama yinede uğraştınız için hepinize
teşekkür ederim. İnşallah olur.

Saygılarımla

[illegible] Kılına,

[illegible] 2005

[illegible] bu raporu hazırladığınız için
[illegible] ederim inşallah bu raporun sonu
[illegible] yani amacınıza ulaşırsınız. bu
[illegible] zararından bıktık usandık. kiran
[illegible] bacaya filitre taktırmanızı diliyoruz
[illegible] yanı sıra külünü zehrini yediği
[illegible] işsiz ve madur durumda kalan
[illegible] bu işsizlik sorununada bir çözüm
[illegible] rseniz memnun oluruz

Saygılarımla,

YAKUP GÜL
Lise Mezunu
Çiftçi

[illegible] 17.08.2007

Düşünüyorumki doğdum doğalı Çoğulhan Kasabasında oturuyorum. ve çoğulhan daki santralın zehirli havasını teneffüz ediyorum. İleride başıma büyük ve ciddi hastalıklar ocacağını bildiğim halde hala buradayım. bu kirlilik sorununun çözülmesi için bu tür raporların düzenlenmesi benim görüşümce bir fayda etmeyecek, lakin hükümet ve K. Maraş, çevre ilçe ve kasabalar, köylerin, başkanları tarafından enerji bakanlığı sağlık bakanlığına bir ziyaret yapılarak, buraya misafir edilip gözleriyle görüp kendileri tarafından havayı teneffüz edip anlamaların sağlamalıyız diye düşünüyorum. O zaman belki bir sonuca varılır düşüncesindeyim. Yetkili kurumların el alıp bizi buradaki zehirli, hastalık virüsünden kurtarmasını diliyorum. Teşekkürler

YAKUP GÜL
Yakup

Ümit SÖNMEZ.
Lise mezunu.

17.03.2015

Raporda yazılanları biz doğduk doğalı yaşıyoruz sadece bilimsel açıklamasını bilmiyoruz. Böyle bir raporun hazırlanması gerçekten çok güzel fakat bu sadece yazılı kağıtlarda değil kamuoyunda ve meclis önünde gündeme gelirse o zaman gerçek amacına ulaşacağına inanıyorum. Göğülhan'ı yanlız bırakmayacağınız için size güveniyor ve teşekkür ediyoruz. Saygılarımla

Ümit SÖNMEZ

İsmail Çetin
Belediye çalışanı

17.03.2015

Rapora biraz göz attım. Ben bunun formalite olduğu şüphesindeyim. Ama yinede böyle bir şeyin hazırlanmasından kasabamız adına mutlu oldum. Bu zamana kadar bu ablbın neden bekledeğinide merak ediyorum doğrusu. İnşallah sesinizi ve sesimizi yetkililere duyurursunuz.
Şimdiden yolunuz açık olsun.
İsmail Çetin

Yakup Sarı 22-08-2005

Ben Çoğulhan Kasabasında 1980 den beri Berberlik yapmaktayım.

Bukasabanın havası santral çalışalı beri hava kirliliği devam etmektedir.

Bunu anlamak için burada yaşamak lazım kasaba sakinleri bunu devamlı yaşıyor.

Bu raporu okudum ve bu rapor ne kadar etkili olacak bunu bilemiyorum.

Ve ayrıca bu raporu hazırladığınız için sizlere çok teşekkür ederim.

Bunun devamlı olmasını diliyorum.

Saygılarımla

Yakup Sarı

Not.

Geçen, Akşam Gazetesinde Bir yazı okudum Akdeniz Üniversitesi Bilim adamlarının açıklamasına göre Toplu ölümlerin en geç 10 yıl sonra yaşanacağını söylüyorlar.

Umarım Geç Kalınmaz

NO 1
DATE [illegible]

Deniz Yılmaz -
[illegible] [illegible] Öğr. -

Aksın Elektrik ve B temiz sanayileri isim olarak
Aksın Elektrik olarak geçiyor. Ama Aslı [illegible] [illegible]
sağlanmıştır çünkü her iki sandalda kurulum içerisinde
ve misafir [illegible]. Temiz sandalyelerin bilgimize ve
kazandırdığı elektrik filtresi vardır. Aksın filtreleri [illegible]
uygun [illegible] zararı [illegible] daha [illegible] bu [illegible]
[illegible] hiç kuşkusuz ve en önemlisi güvenilirliğidir
[illegible] bunun gibi filtreler olan çünkü kalitesi [illegible]
[illegible] [illegible] [illegible] [illegible]. Büyük [illegible] [illegible]
yüzde %40 [illegible] [illegible] [illegible] [illegible] olarak [illegible]
[illegible] sadece [illegible] [illegible] [illegible] Aksın yok
[illegible] [illegible] ve [illegible] ve [illegible] olan
[illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] en iyi ürünü [illegible]
olarak [illegible] [illegible] güvenilirliğiyle [illegible]
[illegible] bu müşteri [illegible] [illegible] [illegible]
yıllarında 11 [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] A temiz sandalyelerine
[illegible] filtre sisteminin [illegible] ve [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] ile [illegible]
[illegible] [illegible] [illegible] [illegible] ve daha bir
çok müşteri [illegible] [illegible] [illegible] bir [illegible]
[illegible] hazırlığın [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] açıklık [illegible] [illegible] ve [illegible] [illegible]
[illegible] [illegible] bilgilendirme [illegible] [illegible]. İnşallah
bu [illegible] sonuç verir ve [illegible] [illegible] [illegible]
[illegible] [illegible] ve en az [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
~~[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]~~
[illegible] Çevreli Arkadaşlara [illegible] [illegible]
işe [illegible] dilerim

[illegible]

[illegible] Mayıs 2005

Durdu Mehmet ASLAN
Öğrenci

Yıllar önce kasabamızda kurulan A santrali ve sonradan yapılmış olan B santralinin insanlarımıza faydasından çok zararı olmuştur.
Öncelikle hava kirliliği, çevre kirliliği ve işsizlik olmak üzere en çok sorunu beraberinde getirmiştir. Santrallerin kasabamıza verdiği hiçbir yararı olmamıştır. Halkımız hastalıklar ve külle mücadele etmek zorunda kalmıştır.
Kasaba insanımız temiz havayı yıllardır soluyamamıştır. Bu santrallerde çalışan işçilerin yabancılar olması ayrıca üzücü bir durumdur. Halkımızın bilinçlenerek bu tür olumsuzluklara tepki göstermesi gerekir.
İsmi Afşin-Elbistan Termik santrali olmasına rağmen kasabamız, bütün sıkıntılarını çekmektedir. Ayrıca kasabamızdan geçen bant yolu kasabamızı ikiye bölmüş ses ve hava kirliliğine neden olmuştur.
Gürültünün yanısıra topraklarımızın verimi azalmış çiftçiler mağdur olmuştur. Halkımızın büyük bir kısmı sağlık sorunları yaşamaktadır.
Şimdiye kadar gözardı edilen baca gazını önlemeye yönelik filtrelerin takılması kaçınılmaz olmuştur. Yetkililerin en kısa zamanda bu sorunlara eğilmesini istiyoruz.
Çoktandır özlediğimiz temiz havayı, bembeyaz karı ve bereketli topraklarımızı istiyoruz. Başta Belediye Başkanı olmak üzere görevli arkadaşlara kasaba halkımızın bilinçlenmesinde gösterdikleri çabadan dolayı teşekkür ederim.

[illegible]

[illegible] Mayıs 2007

Yusuf Çök
Siyertacı

- Afşin-Elbistan Termik Santrali A1 ünitesinin Dünyada kendi sınıfında en üst teknoloji düzeyinde yapıldığı ve geçen zaman süreciyle teknolojinin daha da ileri [illegible] [illegible] bu tahki zamanımızda [illegible] santralin bir yarı[illegible] gelmesi bu santralin yapımında yürümüz teknolojisiyle revize edilmesi kaçınılmazdır. Elbette memleketimizde [illegible] bir yatırım olması [illegible] [illegible] kaynağıdır. Ama bu yatırımdada kaş yaparken göz çıkarmanın hiç anlamı yoktur. Çünkü [illegible] [illegible] [illegible] rakam [illegible] [illegible] insan sağlığından daha önemli olamaz.
Ama burada elektrik üretip memlekete faydalı bir yatırımın insan sağlığına ve bölge halkına zarar teşkil etmesi kabul edilir bir gerçek değildir.
- Hızla gelişen ve [illegible] dünyada Türkiyemiz ve hatta bölgemizde bu gelişme ve değerliliklerden nasibini elbette [illegible] [illegible]. Şimdi [illegible] [illegible] [illegible] [illegible] yarın birgün bu santral çok sorunlara yol açacaktır.
Tek [illegible] [illegible] ve [illegible] [illegible] önyargılı tavırlarını [illegible] [illegible] [illegible] kişi [illegible] birgün herkesin [illegible] [illegible] [illegible]rum. İnsan [illegible] [illegible] sağlığını [illegible] [illegible] için bu çevre kirliliğini [illegible] ediyorum.
Memleketimizin daha nice yatırımlarla kalkınmasını ve [illegible] elbette [illegible] [illegible]. Ama Kaş yaparken göz çıkarmak lazım mıdır. Anlayamıyorum

Yusuf Çök [illegible]

March 2005

Saffet ASLAN

Çiftçi

Maden - Kilistan [illegible] kurulduktan sonra [illegible] çeşitli hastalıklar ve ölümler [illegible]

Ve buna rağmen [illegible] ile [illegible]

Ve buna rağmen [illegible] gelen [illegible] bunu [illegible] göster- memiştir. Aynı zamanda hastalıklar ve [illegible] küçülterek dahi tepki göstererek [illegible] istiyoruz, ve [illegible] istiyoruz

Saffet ASLAN

[illegible]

March 2005

İsmail [illegible]

Esnaf

Afşin Elbistan santralin atığı olduğu kül [illegible] hastalığı ve [illegible] geçtiğimiz zaman hastalık yürüdü [illegible] hava kirliliği [illegible] fazla [illegible] ye yeşil [illegible] maddi ve manevi imkanlarımız olmadığı [illegible] görüyoruz.

En kısa zamanda yetkililer buna bir çözüm getirmesini istiyoruz.

[illegible]

Mayıs 20[illegible]

Hacı Veli Kılınç

İşsiz

Afşin Elbistan A Termik santrali benim doğduğum tarihle hemen hemen beraber. Biz onunla büyüyoruz, gençleşiyoruz ve yaşlanıyoruz. Termik santral de o zamanın teknolojisiyle yapılmış bir eser ama onlar da insan gibi yaşlanıyor ve kullanılmıyor olmasına da [illegible] ediliyor.

Termik santrali çok uzun yıllarda çalışıyor ve kalmış büyük bir enerji potansiyeli. Ama santral ve zamanlar eskidi ve yıprandı. Bunun göstergeleri şehre, köy ve kasabalarda [illegible] derece artmaya başladı. Burada hava kirliliği ve çevre kirliliği olmak üzere çevreye etkileri [illegible] yıllarda [illegible] termik santralinden kül yağıyor, [illegible] kül geliyor. Termik santrali özellikle kış aylarında etrafa zehir yağdırıyor. Kül ve yağmurla birlikte [illegible] gazla [illegible] köy ve kasabalara direkt olarak etkiliyor. Bunun yanı sıra fabrikanın yakıt olarak kullanılan linyit kömürü havada sera etkisi yaparak dünyada [illegible] bir sorun teşkil ettiğini düşünüyorum. Bunun yanı sıra fabrikanın etkisiyle fabrika çevresinde asit yağmurları yağıyor ve [illegible] asitlik toprak ve insan sağlığı zarara uğruyor. Halk [illegible] temsilcilerine söylüyor ve [illegible] duruyor.

Bizim ve halkın genel görüşü fabrikanın en kısa zamanda tamir ve onarımının yapılarak daha önceki yeni yapıldığındaki gibi çevreye etrafına zehir saçmayan bir fabrika istiyoruz. Bizim buradaki fabrika gibi Türkiye'nin değişik yerlerinde kömürle çalışan fabrikalar var ama onlara gösterilen ilgi buraya gösterilmiyor. Burada da en kısa zamanda diğer santraller gibi gerekli önlemler alınarak daha yaşanabilir bir çevre ve yaşam sağlanmasını istiyoruz inşallah. Burada yazılanlar [illegible] zamanı gibi bu defa da kalmaz ve halkın görüşleri dikkate alınır.

saygılarımla

[illegible]

Yakup YANIK
Boz.

Mart 2007

KARNIMIZ TOK ÖLELİM.

Yıllar Önce büyüklerimizin verdiği kararla yapılan A Termik Santralinin yaptığı zararları ve yapılan Mücadeleri kınamak ve Münakaşa yapmak herhalde biraz Vijdansızlık Olur diyerek Biz insanmıyız ki konuşma hakkımız Olsun Biz insanmıyız ki bizim sesimizi duysunlar Biz insanmıyız ki bizim burada külden zarar gördüğümüzü bilsinler Edebiyatı bırakarak biraz gerçeklerden Söz Edelim.

Yıllar Önce Tertemiz Sağlık dolu insanlar artık Sürünerek Ölüyorlar. Yıllar Önce görülmeyen Hastalıklar Piyasaya Salgın bir hastalık Olarak Hakim Oldu.

Kalp Krizi Riski, Şeker Hastalığı - Tansiyon bunların en Önemlisi KOAH (Astım) hastalığı Artık kasabamızın 25,30 yaşlarında görülmeye başladı. Bizim Sesimiz gür değil Ama gün gelecek bu zararı bu insanlara bir tutum çıkarları için veren insanlar Mutlaka bu zararın bu insanların ahlarını her hastanın Oflamasında her acı çektiğinde nefeslerinde hissedeceklerdir.

Bunun yanısıra Çekiliyoruz bu külü bal - ekmek gibi çiğnerken Duyun Artık En azından bu külden zarar gören İnsanların Sesini Kulağınıza Sokuyoruz bu fabrikanın külüğünde iş verin iş verinde azıcık zamana gitmesin zararımızda kendimizi Birazcık kandıralım, umut Edelim Sürünerek Ölsekte Hastalıktan Ölsekte karnımız tok Öleceğiz diye.

Yakup YANIK

March 2005

Ahmet Çetin
Boş.

Termik santrali kurulurken çoğulhan Halkı ve diğer çevre köy ve kasabalar çok ümitlenmiş ve A Termik santrolinden faydolonacağın düşünerek bir iş bulurğuz diye sevinmişlerdi. Ve hiçte umdukları gibi olmadı hani bir söz vardır umduğunu değil bulduğunu. Ama bundan ziyade çoğulhan holkı iş bulmayı bıroksınlar kapıdan içeriye giremedi ve santrol zoman zoman eskimeye başladı ve bugün üstümüze kül ve katı, sıvı, gaz atmaya başladı. Ve daha sonra hastalık görülmeye başladı. bugün çoğulhanın büyük bir bölümü hasta nedeni ise A TERMİK SANTRALİ doğrusunu söylemek gerekirse termik CANAVARI. ~~ve~~ ~~dolp~~ çünki bu santral çoğulhan ve çevre köylerede zarar vermektedir. bize zararı olurken şöyle anlatayım köyün halkı verem, kanser, ve Lösemi hastası ve köyün birçoğunun doktor raporu var. biz hastaneye gittimiz zaman doktorlar soruyor siz neden böyle hasta oluyorsunuz diye Ama bilmiyorlarki Termik santralinden olduğunu ve hayretler içinde kalıyorlar

NO

DATE [illegible]

ÇOĞULHAN'a AZ BİLE

Çoğulhan ve Bölge İnsanına bu eziyet az Biraz fazla daha kül bırakın bıraktınız da Çarçabuk ölelim Her Of çekerek değil Ani Şok Ölümle Bize fazla Eziyet Etmeyin Bir iki Santral daha yapın Hem Aç hemde Kanser Olarak Ölelim. O Zaman düşlerinizde görüşmek umuduyla

Hakkı Koç

T.C.
ÇEVRE ve ORMAN BAKANLIĞI
Çevresel Etki Değerlendirme ve Planlama Genel Müdürlüğü
......İDK KOMİSYON ÜYESİ GÖRÜŞ TUTANAĞI

Faaliyetin Adı:

2[illegible] 2005

[illegible] ELBİSTAN TERMİK SANTRALI [illegible]
[illegible] ve Baca Gazı
[illegible] Tesis
Edilmesi Projesi

1. [illegible]
[illegible]
2. [illegible]
edilmesi
3. B. termik santraline kömür işletmesinin
[illegible] baca açılması
4. Bu proje alanında imar planında bulunan
santralda Göğültan'dan işçi alınması
5. AFŞİN ELBİSTAN TERMİK SANTRALI
Rehabilitasyon ve Baca Gazı
Desülfürizasyon ünitelerinin tesis edilme projesini
Bu şekliyle onaylıyorum

6. Cuma veya pazartesi günündeki toplantıya
katılamıyorum

7. Su set kapanında bulunan projenin uygulanmasında
İstihdamın Göğültan veya Afşin esnaflarının
sadece Göğültan kasabasında ikamet ve ~~istihdam~~
İstihdam edilmesi diye değiştirilmesini istiyorum

Adem YILDIZ
Göğültan Belediye Bşk.

ANNEX B8

TUBITAK-MAM SO_2 MEASUREMENT RESULTS

TÜBİTAK

TÜRKİYE BİLİMSEL VE TEKNİK ARAŞTIRMA KURUMU
MARMARA ARAŞTIRMA MERKEZİ

ELEKTRİK ÜRETİM A.Ş. GENEL MÜDÜRLÜĞÜ
Çevre-Yeni ve Yenilenebilir Enerji Kaynakları Daire Başkanlığı

AFŞİN-ELBİSTAN (A) TERMİK SANTRALI ÇEVRE HAVASINDA SO_2 ÖLÇÜMLERİ FİNAL RAPORU

Hazırlayanlar
Osman ÇOLAK
Nesimi ÖZKURT
Enver İNCE
Yavuz ŞAHİN
Abuseyf ŞEN

KASIM 2003

UKAS QUALITY MANAGEMENT 005

Deutscher Akkreditierungs Rat
DAP-PL-3577.00

ISO 9001

TÜBİTAK – MAM, P.K. 21, GEBZE, 41470 KOCAELİ
e-posta : escaeweb@posta.mam.gov.tr
Tel : (0262) 641 23 00/3900–01
Faks :(0262) 641 23 09

4. BULGULAR VE DEĞERLENDİRME

Ölçüm sonuçları, 2 Kasım 1986'da yayımlanan Hava Kalitesinin Korunması Yönetmeliği esaslarına göre değerlendirilmiştir.

03.08.2003 ve 04.11.2003 tarihleri arasındaki kükürt dioksit (SO_2) gazı konsantrasyonu ölçüm sonuçları değerlendirilirken, kükürt dioksit gazı konsantrasyonu için Kısa Vadeli Sınır değer (KVS) olan **400 $\mu g/m^3$** değeri (24 saatlik ortalama) baz alınmıştır. Bu durumda, 24 saatlik ölçüm ortalama değerlerinin kısa vadeli sınır değerinin altında kaldığı görülmektedir.

01.11.2002 ve 04.11.2003 tarihleri arasında yaklaşık bir yıl süren ölçümler, Kısa Vadeli Sınır değeri açısından değerlendirildiğinde, sayısal değerlerinin %95'nin günlük ortalamalarının genel bölgeler için verilen **400 $\mu g/m^3$** değerini aşmadığı görülmektedir.

Uzun Vadeli Sınır (UVS) değeri açısından ölçüm sonuçları değerlendirilirken, 01.11.2002 ve 04.11.2003 tarihleri arasında yaklaşık bir yıl süren ölçümlerin sonuçları incelendiğinde, tüm ölçüm sonuçlarının aritmetik ortalaması olan **13 $\mu g/m^3$** Uzun Vadeli Ortalama Değerinin **(UVD),** Hava Kalitesinin Korunması Yönetmeliği'nde genel bölgelerde SO_2 için verilen UVS değeri olan **150 $\mu g/m^3$**'ün altında olduğu görülmektedir.

ANNEX B9

ANALYSIS OF LIMESTONE USED AT FGD PLANT

M.Etüd ve D.Bşk.
Mahmut Danış

4 8 3

Rap NO : 730

93/90 a.
93/122

Afşin-Elbistan Kışla işaretli ve diğer işaretleri aşağıda yazılı numunelerin analiz neticeleri:

zi:	SiO_2 %	R_2O_3 %	CaO %	MgO %	A.Za %
M-1	0.15	0.34	55.40	0.38	43.70
M-2	0.06	0.43	54.23	0.90	43.72
M-3	0.12	0.38	55.32	0.38	43.80
M-4	0.12	0.37	55.19	0.70	43.67
M-5	0.14	0.65	55.14	0.50	43.56
M-6	0.04	0.71	55.14	0.45	43.66
M-7	0.14	0.46	55.30	0.50	43.60
M-8	0.20	0.46	55.30	0.50	43.63
M-9	0.21	0.52	55.14	0.50	43.71
M-10	0.17	0.52	55.21	0.50	43.60
M-11	0.18	0.52	55.14	0.50	43.66
M-12	0.19	0.55	55.14	0.63	43.48

	SiO_2 %	CaO %	MgO %	R_2O_3 %	A.Za %
M-13	0.10	55.50	0.70	0.15	43.40
M-14	0.15	55.90	0.45	0.35	43.45
M-15	0.15	55.90	0.45	0.40	43.45
M-16	0.40	55.50	0.70	0.45	43.60
M-17	0.10	55.20	0.50	0.40	43.40
M-18	0.25	55.80	0.60	0.45	43.40
M-19	0.20	54.40	2.30	0.30	43.60
M-20	0.40	55.25	1.10	0.40	43.50
M-21	0.15	55.25	0.35	0.35	43.15
M-22	0.10	55.80	0.35	0.25	43.35
-23	0.20	55.25	0.50	0.25	43.25
M-24	0.25	55.00	0.45	0.35	43.15

Rap NO: 730

Arazi :	SiO_2 %	R_2O_3 %	CaO %	MgO %	A.Za
M-25	0.10	0.30	55.00	0.40	43.70
-26	0.20	0.20	55.20	0.40	43.70
M-27	0.10	0.20	54.80	1.20	43.80
M-28	0.10	0.30	55.30	0.30	43.70
M-29	0.20	0.25	55.70	0.30	43.60
M-30	0.20	0.30	55.70	0.30	43.60
M-31	0.15	0.15	55.40	0.35	43.60
M-32	0.15	0.20	55.40	0.35	43.60
M-33	0.10	0.20	55.40	0.40	43.75
M-34	0.20	0.40	55.50	0.40	43.75
M-35	0.15	0.25	55.00	0.40	43.85
M-36	Yok	0.20	53.00	2.00	43.80

Saygılarımızla,

MADEN ETÜD VE ARAMA DAİRESİ BAŞKANLIĞI

MAHMUT DANIŞ

144 13 8 3

784

93/90 a

(Afşin Elbistan Kışlaköy Mırmır) işaretli ve diğer işaretleri aşağıda belirtilen numunelerin analiz neticesi:

	Arazi No:	SiO_2 %	R_2O_3 %	CaO %	MgO %	A.Za %
55800	M-37	0.10(k)	0.12	55.10	0.58	43.92
55801	M-38	0.16	0.14	55.20	0.41	43.91
55802	M-39	0.10(k)	0.15	55.20	0.49	43.90
55803	M-40	0.10 "	0.13	55.40	0.40	43.91
55804	41	0.10 "	0.14	55.30	0.41	43.91
55805	42	0.23	0.26	55.10	0.42	43.80
55806	43	0.14	0.14	55.30	0.46	43.84
55807	44	0.27	0.32	55.10	0.40	43.83
55808	45	0.10(k)	0.15	55.40	0.39	43.95
55809	46	0.10(k)	0.13	55.40	0.46	43.90
55810	47	0.19	0.30	55.10	0.45	43.75
55811	48	0.10(k)	0.06	55.40	0.45	43.84
55812	49	0.29	0.32	55.10	0.47	43.74
55813	50	0.21	0.26	55.00	0.55	43.78
55814	51	0.17	0.18	53.00	2.35	44.19
55815	52	0.10(k)	0.13	55.20	0.58	43.87
55816	53	0.10(k)	0.15	55.20	0.56	43.88
55817	54	0.18	0.22	55.00	0.61	43.93
55818	55	0.30	0.33	54.70	0.52	43.98
55819	56	0.22	0.15	55.10	0.47	43.97
55820	57	0.10(k)	0.15	55.20	0.35	44.20
55821	58	0.10 "	0.15	55.00	0.35	43.90
55822	59	0.10 "	0.05	55.15	0.30	43.95
55823	60	0.10	0.15	53.30	1.80	44.05
55824	61	0.10	0.15	54.65	0.90	44.05
55825	62	0.20	0.20	54.00	1.40	44.05

784

	Arazi no:	SiO_2 %	R_2O_3 %	CaO %	MgO %	A.Za %
55826	M-63	0.40	0.40	53.20	1.60	43.95
--827	64	0.10(k)	0.10	55.20	0.30	43.85
-5828	65	0.10 "	0.15	55.05	0.35	43.90
-55829	66	0.15	0.20	54.95	0.35	43.95
55830	67	0.10(k)	0.25	54.85	0.40	43.95
55831	68	0.20	0.20	54.70	0.40	43.85
55832	69	0.10(k)	0.10	54.95	0.45	43.95
55833	70	0.10 "	0.20	54.95	0.50	43.90
55834	71	0.15	0.25	55.00	0.40	43.85
55835	72	0.10	0.10	54.85	0.45	43.90
55836	73	0.30	0.30	54.70	0.40	44.00
55837	74	0.10	0.15	54.90	0.35	43.95
55838	75	0.60	0.45	54.55	0.35	43.65
55839	76	0.10	0.15	54.90	0.35	43.95
+0	MÖ-1					
55841	Ma-1					
55842	Md-1					
55843	Mk-1	0.20	0.15	54.80	0.40	43.80
55844	M-77	0.10(k)	0.20	55.15	0.30	43.95
55845	M-78	0.10 "	0.20	53.25	2.20	44.15

NS/.

Saygılarımızla,

Oltan

93/185 MADEN ETÜD VE ARAMA DAİ.BŞK. 4 10 3

306 986

93/90 a

M.Danış

Afşin Elbistan Kışla mevkilerinden gelen diğer işaretleri aşağıda yazılı numunelerin analiz neticeleri:

	Arazi:	SiO_2 %	R_2O_3 %	CaO %	MgO %	A.Za %
56309	M.79	0.15	0.45	55.00	0.35	43.80
56310	" 80	0.15	0.40	54.60	0.30	43.75
56311	" 81	0.15	0.30	53.80	1.00	43.85
56312	" 82	0.30	0.45	54.20	0.45	43.80
56313	" 83	0.15	0.60	53.00	1.50	43.90
56314	" 84	0.15	0.50	51.80	2.80	44.15
56315	" 85	0.10	0.70	54.00	0.50	43.80
56316	" 86	0.15	0.45	54.80	0.50	43.80
56317	" 87	0.10	0.50	54.10	0.60	43.90
56318	" 88	0.10	0.50	54.10	0.60	43.90
56319	" 89	0.10	0.60	53.80	1.00	43.90
56320	" 90	0.10	0.70	54.50	0.45	43.80
56321	" 91	0.10	0.50	54.50	0.40	43.50
56322	" 92	0.15	0.50	55.40	0.40	43.60
56323	" 93	0.10	0.40	54.50	0.45	43.70
56324	" 94		0.70	54.00	0.60	43.70
56325	" 95	0.40	0.70	54.20	0.65	43.70
56326	" 96	0.70	1.00	53.60	0.60	44.00
56327	" 97	0.15	0.40	54.50	0.60	43.70
56328	" 98	0.50	0.50	54.00	0.50	43.60
56329	" 99	0.25	0.60	54.10	0.50	43.70
56330	" 100	0.25	0.30	54.50	0.60	43.70
56331	MK-2	0.10	0.30	54.80	0.50	43.55

Saygılarımızla,

.JA/

ANNEX B10

METEOROLOGY RECORDS

Enl· : 38.15
Boy. : 36.55
Yuks ık : 1180 m

(KAHRAMANMARAS) AFSIN

METEOROLOJIK ELEMANLAR	Rasat S. (YIL)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	YILLIK
		AYLAR												
Saat 07 deki Ortalama Bulutluluk (0-10)	30	6.7	6.1	5.2	5.2	3.7	1.6	0.6	0.6	1.2	3.6	5.0	6.8	3.9
Saat 14 deki Ortalama Bulutluluk (0-10)	30	6.2	5.9	5.8	6.1	5.8	4.0	2.3	2.2	2.8	4.4	5.2	6.4	4.8
Saat 21 deki Ortalama Bulutluluk (0-10)	30	5.6	4.9	4.4	4.3	3.9	2.4	1.0	0.8	1.3	3.1	4.0	5.5	3.4
Ortalama Bulutluluk (0-10)	30	6.2	5.6	5.1	5.2	4.5	2.7	1.3	1.2	1.8	3.7	4.7	6.3	4.0
Ort. Acik Gunler Sayisi (bult. 0.0-1.9)	30	4.2	5.0	6.3	3.8	5.5	12.9	22.9	23.7	18.6	10.9	7.6	4.0	125.4
Ort. Bulutlu Gunler Sayisi (bult. 2.0-8.0)	30	15.0	14.8	18.2	21.8	22.8	16.7	8.1	7.3	11.2	16.8	16.1	15.4	184.2
Ort. Kapali Gunler Sayisi (bult. 8.1-10.0)	30	11.7	8.5	6.5	4.4	2.7	0.4	0.1		0.1	3.3	6.3	11.6	55.6
Saat 07 deki Ort. Toplam Yagis Miktari (mm)	28	16.1	12.2	15.6	12.5	12.2	1.3	0.3	0.1	1.4	10.0	16.0	22.6	120.3
Saat 14 deki Ort. Toplam Yagis Miktari (mm)	28	7.6	8.6	10.7	10.6	9.9	1.6	0.2	0.1	0.7	6.4	8.9	11.2	76.5
Saat 21 deki Ort. Toplam Yagis Miktari (mm)	28	10.7	8.5	11.2	13.7	12.3	6.8	1.2	0.7	3.8	7.6	12.3	12.8	101.6
Ortalama Toplam Yagis Miktari (mm)	28	57.3	46.9	54.6	56.6	52.4	14.7	4.7	1.1	8.2	34.8	49.1	64.8	445.2
Gunluk En Cok Yagis Miktari (mm)	28	45.4	33.4	44.0	42.3	45.0	14.1	36.8	4.2	18.2	32.3	56.1	53.2	56.1
Yagis >= 0.1 mm Oldugu Gunler Sayisi	28	10.1	10.4	10.7	10.8	9.9	4.9	1.6	1.0	2.6	7.0	7.7	10.6	87.3
Yagis >= 10 mm Oldugu Gunler Sayisi	28	1.7	1.4	1.5	1.9	1.6	0.4	0.1		0.2	1.3	1.5	2.1	13.7
Yagis >= 50 mm Oldugu Gunler Sayisi	28											0.0	0.0	0.0
Ortalama Kar Yagisli Gunler Sayisi	30	8.0	7.5	4.6	0.7	0.2					0.1	1.6	5.8	27.9
Ortalama Kar Ortulu Gunler Sayisi	19	17.9	12.5	6.7	0.4		0.1				0.1	3.3	12.3	53.3
En Yuksek Kar Ortusu Kalinligi (cm)	20	65.0	69.0	74.0	8.0						1.0	31.0	39.0	74.0
Ortalama Sisli Gunler Sayisi	30	4.7	1.7	0.8	0.1	0.1	0.0				0.1	1.5	4.5	12.7
Ortalama Dolulu Gunler Sayisi	30		0.0	0.1	0.3	0.4	0.1	0.0		0.1	0.1	0.0	0.0	1.1
Ortalama Kiragili Gunler Sayisi	30	7.7	7.8	9.4	3.6	0.7				0.4	5.3	15.0	11.5	58.7
Ortalama Orajli Gunler Sayisi	30	0.1	0.1	0.3	2.4	5.5	4.0	1.7	1.1	2.1	1.7	0.1	0.1	19.2
Saat 07 deki Ortalama Ruzgar hizi (m/s)	19	1.1	1.2	1.3	1.3	1.1	1.3	1.2	0.9	0.7	0.7	1.0	1.1	1.1
Saat 14 deki Ortalama Ruzgar hizi (m/s)	19	1.9	2.6	3.2	4.0	3.4	3.2	3.0	2.6	2.7	2.4	2.1	2.0	2.8
Saat 21 deki Ortalama Ruzgar hizi (m/s)	19	1.3	1.8	2.2	2.9	2.4	2.5	2.9	3.0	2.4	1.6	1.4	1.3	2.1
Ortalama Ruzgar Hizi (m/s)	19	1.4	1.9	2.2	2.7	2.3	2.3	2.4	2.1	1.9	1.6	1.5	1.4	2.0
En Hizli Esen Ruzgarin Yonu	30	SSE	NW	SE	NNW	SW	SW	NW	SE	SSW	ESE	NW	S	SSW
En Hizli Esen Ruzgarin Hizi (m/s)	30	23.0	22.6	21.1	23.5	21.6	21.4	19.5	24.4	25.0	20.0	21.2	20.2	25.0
Ort. Firtinali Gun Say. (ruz.hiz>=17.2 m/s)	19	0.4	1.0	1.1	1.4	0.9	0.6	0.2	0.4	0.4	0.2	0.6	0.7	7.9
Ort. Kuv.Ruz. Gun Say. (ruz.hiz 10.8-17.1 m/s)	19	4.2	6.0	9.2	13.7	10.7	11.1	10.4	9.3	7.1	4.9	4.4	4.7	95.7
N Ruzgarin Esme Sayilari Toplami	19	81	57	79	52	69	136	182	155	93	52	71	65	1092
N Ruzgarin Ortalama Hizi (m/s)	19	2.6	3.5	3.6	3.4	2.3	3.0	3.0	3.0	2.7	2.4	2.6	1.9	2.8
NNE Ruzgarin Esme Sayilari Toplami	19	152	110	112	75	89	167	183	171	128	128	127	139	1581
NNE Ruzgarin Ortalama Hizi (m/s)	19	1.3	2.0	2.1	2.0	1.7	2.4	2.5	2.2	1.9	1.5	1.4	1.3	1.9
NE Ruzgarin Esme Sayilari Toplami	19	89	67	62	35	62	70	79	77	61	65	71	78	816
NE Ruzgarin Ortalama Hizi (m/s)	19	1.2	1.7	1.8	2.1	1.9	1.6	1.9	2.1	1.6	1.4	1.7	1.1	1.6
ENE Ruzgarin Esme Sayilari Toplami	19	179	157	121	101	138	122	86	121	106	152	169	188	1640
ENE Ruzgarin Ortalama Hizi (m/s)	19	1.1	1.2	1.7	1.6	1.5	1.3	1.5	1.7	1.5	1.3	1.2	1.0	1.3
E Ruzgarin Esme Sayilari Toplami	19	99	80	78	31	41	49	26	34	33	52	77	67	667
E Ruzgarin Ortalama Hizi (m/s)	19	1.1	1.4	1.5	1.3	1.5	1.5	1.6	1.4	1.1	1.3	1.0	1.0	1.3
ESE Ruzgarin Esme Sayilari Toplami	19	156	142	120	92	94	59	45	38	55	146	170	201	1318
ESE Ruzgarin Ortalama Hizi (m/s)	19	1.3	1.5	2.0	2.0	1.7	1.5	1.8	1.6	1.5	1.4	1.2	1.2	1.5
SE Ruzgarin Esme Sayilari Toplami	19	73	96	78	79	58	50	36	29	50	54	95	104	802
SE Ruzgarin Ortalama Hizi (m/s)	19	1.7	2.7	2.8	3.0	2.4	1.9	2.0	1.6	2.1	1.9	1.3	2.1	2.2
SSE Ruzgarin Esme Sayilari Toplami	19	188	142	183	170	128	84	89	64	100	157	147	166	1618
SSE Ruzgarin Ortalama Hizi (m/s)	19	1.6	1.5	1.7	2.2	1.9	1.7	1.7	1.6	1.7	1.5	1.4	1.6	1.7

Boyl~~ : 36.55
Yuk ik : 1180 m

(KAHRAMANMARAS) AFSIN

METEOROLOJIK ELEMANLAR	Rasat S. (YIL)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	YILLIK
		AYLAR												
Ortalama Yerel Basinc (hPa)	19	879.7	878.2	876.6	876.3	876.8	875.5	873.8	874.8	877.8	880.3	880.8	880.2	877.6
En Yuksek Yerel Basinc (hPa)	19	891.8	891.3	890.0	885.9	885.7	882.7	881.1	879.7	885.4	887.4	890.7	891.8	891.0
En Dusuk Yerel Basinc (hPa)	19	858.0	856.7	860.3	864.5	866.4	866.1	866.9	869.1	870.6	868.6	861.6	862.0	856.7
Saat 07 deki Ortalama Sicaklik (C)	30	- 5.6	- 4.7	- 0.4	6.5	11.6	15.8	18.6	17.3	11.7	6.2	0.6	- 2.9	6.2
Saat 14 deki Ortalama Sicaklik (C)	30	0.0	2.4	8.0	14.7	19.7	24.8	29.5	29.7	25.7	18.7	9.9	2.9	15.5
Saat 21 deki Ortalama Sicaklik (C)	30	- 3.6	- 1.8	3.3	9.5	13.7	18.1	22.3	22.1	17.4	11.1	3.9	- 0.9	9.6
Ortalama Sicaklik (C)	30	- 3.2	- 1.5	3.5	10.0	14.7	19.2	23.2	22.8	18.1	11.8	4.6	- 0.4	10.2
Ort. Sicaklik >= 5 C Old. Gunler Sayisi	30	0.5	1.7	12.3	27.8	31.0	30.0	31.0	31.0	30.0	29.7	15.2	3.7	243.9
Ort. Sicaklik >= 10 C Old. Gunler Sayisi	30			2.2	14.9	28.4	30.0	31.0	31.0	29.7	21.8	2.5		191.5
Ortalama Yuksek Sicaklik	30	1.2	3.7	9.3	16.1	21.0	26.0	30.5	30.7	26.7	19.8	10.9	3.8	16.6
Ortalama Dusuk Sicaklik	30	- 7.0	- 5.8	- 1.7	3.8	7.1	10.1	13.0	12.8	8.8	4.7	- 0.4	- 3.9	3.5
En Yuksek Sicaklik Gunu	30	31	26	27	13	31	20	28	4	3	1	3	1	27
En Yuksek Sicaklik Yili	30	2001	1977	2001	2004	1990	1998	2001	1991	2003	1999	2004	1990	2001
En Yuksek Sicaklik (C)	30	12.2	16.9	23.2	27.3	32.0	34.8	38.4	38.2	35.2	31.2	21.4	14.2	38.4
Yuk. Sicaklik >=30 C Old. Ort. Gunler Sayisi	30					0.4	4.5	18.5	20.1	6.1	0.1			49.7
Yuk. Sicaklik >=25 C Old. Ort. Gunler Sayisi	30				1.1	5.7	19.4	29.4	29.7	22.0	4.6			111.9
Yuk. Sicaklik >=20 C Old. Ort. Gunler Sayisi	30			0.8	6.8	19.3	28.6	31.0	31.0	28.5	16.4	0.4		162.8
Yuk. Sicaklik <=-0.1 C Old. Ort. Gunler Sayisi	30	11.0	6.4	1.7	0.0							1.0	5.6	25.7
Gunluk En Yuksek Sicaklik Farki														
En Dusuk sicaklik Gunu	30	31	7	2	5	2	3	5	17	26	23	24	27	7
En Dusuk sicaklik Yili	30	1980	1991	1976	2004	1981	1978	1976	1975	1983	1977	2001	2002	1991
En Dusuk Sicaklik (C)	30	-26.6	-27.3	-20.7	-11.0	- 1.7	2.0	5.2	4.8	- 0.4	- 6.00	-20.8	-24.2	-27.3
Dus. Sicaklik <=-0.1 C Old. Ort. Gunler Sayisi	30	26.9	23.4	18.7	3.4	0.3				0.0	2.7	16.4	23.1	114.9
Dus. Sicaklik <=-3 C Old. Ort. Gunler Sayisi	30	20.9	17.6	9.9	0.7						0.7	8.2	16.4	74.4
Dus. Sicaklik <=-5 C Old. Ort. Gunler Sayisi	30	17.4	13.7	6.4	0.3						0.2	4.5	12.1	54.6
Dus. Sicaklik <=-10 C Old. Ort. Gunler Sayisi	30	9.4	6.4	2.1	0.0							0.6	4.4	22.9
Dus. Sicaklik <=-15 C Old. Ort. Gunler Sayisi	30	4.2	2.7	0.6								0.2	1.0	8.7
Dus. Sicaklik <=-20 C Old. Ort. Gunler Sayisi	30	1.9	1.2	0.1								0.1	0.2	3.5
Dus. Sicaklik >=20 C Old. Ort. Gunler Sayisi	30							0.1	0.1					0.2
Dus. Sicaklik >=15 C Old. Ort. Gunler Sayisi	30				0.0		0.6	8.0	6.7	0.6	0.0			15.9
Dus. Sicaklik >=10 C Old. Ort. Gunler Sayisi	30				0.7	5.3	16.4	27.3	26.6	11.1	1.4	0.0		88.8
Dus. Sicaklik >=5 C Old. Ort. Gunler Sayisi	30	0.0	0.1	1.5	11.0	24.6	29.5	31.0	30.9	26.7	15.1	3.9	0.8	175.1
Ortalama Toprakustu Minimum Sicaklik	19	- 9.1	- 8.1	- 4.5	0.7	4.3	7.3	10.1	9.9	5.7	2.2	- 3.1	- 6.3	0.8
En dusuk Toprakustu Minimum Sicaklik	19	-26.5	-29.6	-24.8	-13.8	- 5.6	0.4	1.0	- 0.5	- 5.1	- 9.6	-25.2	-29.8	-29.8
Top. us. min. sic. <=-0.1 C Old. Gunler Sayisi	19	28.7	26.4	24.3	11.7	2.8			0.1	1.2	8.3	21.2	25.6	150.3
Top. us. min. sic. <=-3 C Old. Gunler Sayisi	19	24.3	21.6	17.9	5.4	0.8				0.2	2.9	15.8	19.9	108.8
Top. us. min. sic. <=-5 C Old. Gunler Sayisi	19	21.1	18.4	14.0	2.6	0.1				0.1	0.8	11.1	16.3	84.5
Top. us. min. sic. <=-10 C Old. Gunler Sayisi	19	12.4	9.1	4.4	0.2							2.8	8.8	37.7
Ortalama Buhar Basinci (hPa)	30	4.1	4.3	5.3	7.0	9.1	10.4	11.5	11.2	9.4	7.9	6.0	4.9	7.6
Saat 07 deki Ortalama Bagil Nem (%)	30	84	83	81	75	70	62	59	62	70	80	85	85	74
Saat 14 deki Ortalama Bagil Nem (%)	30	69	61	51	42	38	31	25	24	26	37	51	67	44
Saat 21 deki Ortalama Bagil Nem (%)	30	81	77	69	60	59	51	42	42	48	61	75	81	62
Ortalama Bagil Nem (%)	30	78	74	68	59	56	48	42	43	48	60	70	78	60
En dusuk Bagil Nem (%)	30	14	10	6	3	3	2	1	1	3	2	8	19	1

Ist~ ~nun Calisma Suresi : 1975 - 2004 ARASTIRMA ve BILGI ISLEM DAIRE BASKANLIGI

Enl : 38.15
Boyl : 36.55
Yukseklik : 1180 m

(KAHRAMANMARAS) AFSIN

	METEOROLOJIK ELEMANLAR	Rasat S. (YIL)	AYLAR I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	YILLIK
S	Ruzgarin Esme Sayilari Toplami	19	98	73	85	83	98	57	51	59	68	108	102	95	977
S	Ruzgarin Ortalama Hizi (m/s)	19	1.5	1.5	2.2	2.9	2.7	2.2	2.0	1.9	1.7	2.0	1.3	1.4	1.9
SSW	Ruzgarin Esme Sayilari Toplami	19	107	150	200	265	284	154	143	172	229	245	170	124	2243
SSW	Ruzgarin Ortalama Hizi (m/s)	19	2.3	2.4	2.4	3.7	3.2	3.1	3.0	2.7	2.2	2.1	1.9	2.1	2.7
SW	Ruzgarin Esme Sayilari Toplami	19	25	64	106	164	125	86	66	111	152	119	78	52	1148
SW	Ruzgarin Ortalama Hizi (m/s)	19	3.4	3.3	3.6	4.1	3.8	3.6	2.9	2.8	3.2	2.6	3.2	3.0	3.3
WSW	Ruzgarin Esme Sayilari Toplami	19	43	43	87	148	101	81	68	86	112	87	50	51	957
WSW	Ruzgarin Ortalama Hizi (m/s)	19	1.9	2.5	2.7	2.7	2.3	2.3	2.1	2.1	2.0	1.7	1.8	2.4	2.2
W	Ruzgarin Esme Sayilari Toplami	19	14	9	19	27	33	23	28	15	22	36	8	20	254
W	Ruzgarin Ortalama Hizi (m/s)	19	1.7	1.2	1.5	2.2	2.4	1.9	1.3	1.3	1.2	1.1	0.8	2.0	1.6
WNW	Ruzgarin Esme Sayilari Toplami	19	28	32	33	49	60	68	42	46	45	49	23	40	515
WNW	Ruzgarin Ortalama Hizi (m/s)	19	1.2	1.3	2.3	2.3	2.0	1.7	1.5	1.5	1.7	1.2	1.7	1.4	1.7
NW	Ruzgarin Esme Sayilari Toplami	19	42	47	47	61	60	72	120	115	71	41	62	44	782
NW	Ruzgarin Ortalama Hizi (m/s)	19	2.5	3.3	3.7	3.4	3.0	3.1	3.0	2.5	2.2	2.7	3.7	2.8	3.0
NNW	Ruzgarin Esme Sayilari Toplami	19	110	116	132	107	148	270	372	311	187	97	113	121	2084
NNW	Ruzgarin Ortalama Hizi (m/s)	19	2.1	2.9	3.3	3.3	2.4	2.9	3.0	2.8	2.7	1.8	2.2	2.4	2.7
	Ortalama 5 cm Toprak Sicakligi (C)	19	-0.6	0.3	5.1	12.4	18.7	24.6	29.5	29.2	22.9	13.7	4.6	0.6	13.4
	En dusuk 5 cm Toprak sicakligi (C)	19	-10.0	-6.8	-3.4	0.9	7.7	15.9	19.8	20.7	13.4	2.1	-9.5	-8.2	-10.0
	Ortalama 10 cm Toprak Sicakligi (C)	19	-0.4	0.2	4.7	11.9	17.9	23.4	27.5	27.9	22.3	13.7	4.8	0.9	12.9
	En dusuk 10 cm Toprak sicakligi (C)	19	-9.2	-6.1	-3.2	1.5	8.7	16.7	20.5	21.7	13.5	3.3	-7.3	-9.9	-9.9
	Ortalama 20 cm Toprak Sicakligi (C)	19	0.1	0.3	4.5	11.3	17.3	22.7	26.4	26.7	21.9	14.1	5.6	1.4	12.7
	En dusuk 20 cm Toprak sicakligi (C)	19	-6.4	-5.0	-1.9	2.2	9.4	16.1	21.2	22.2	14.9	4.9	-3.8	-8.7	-8.7
	Ortalama 50 cm Toprak Sicakligi (C)	19	2.3	1.8	4.7	10.3	15.7	20.8	24.5	25.6	22.2	15.9	8.4	4.0	13.0
	En dusuk 50 cm Toprak sicakligi (C)	19	-0.8	-0.5	0.6	4.6	10.3	15.5	20.8	22.3	16.8	9.6	2.7	-1.0	-1.0
	Ortalama 100 cm Toprak Sicakligi (C)	19	5.3	4.2	5.4	9.0	13.2	17.4	20.9	22.6	21.3	17.3	11.9	7.6	13.0
	En dusuk 100 cm Toprak sicakligi (C)	19	1.2	0.5	2.5	4.2	9.4	13.8	16.7	19.3	0.0	12.7	2.4	0.7	0.0
	Ortalama Buharlasma (mm)	18				55.3	144.8	191.8	237.9	225.9	155.0	77.9	11.3		
	Gunluk En Cok Buharlasma (mm)	18	0.0	0.0	0.0	6.0	12.4	14.0	13.2	12.0	9.7	7.8	2.4	0.0	14.0
	Gunluk Ort. Guneslenme Suresi (saat,dakika)		00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00	00:00
	Gunluk Ort. Guneslenme Sidt.(cal/cm^2.dak)														0.00
	Aylik En Yuk. Guneslenme Sidt.(cal/cm^2.dak)														
	Ortalama Deniz Suyu Sicakligi (C)														0.0
	En Yuksek Deniz Suyu Sicakligi (C)														
	En dusuk Deniz Suyu Sicakligi (C)														

ANNEX B11

OPERATION DATA

AFŞİN ELBİSTAN A TERMİK SANTRALININ 1 ŞUBAT - 7 NİSAN TARİHLERİ ARASI SAATLİK YÜK DEĞERLERİ (MW)

	SAAT	ŞUBAT 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1.ÜNİTE								250	230	250	260	250	220	200	170			290	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	290	290	300	310	240
	02							230	220	260	260	260	180	190	80			300	290	70	270	270	270	270	290	300	300	300	230
	03							200	230	250	250	230	180	190			20	300	300	210	240	250	240	250	290	300	300	290	220
	04							210	240	250	250	230	190	200			180	300	250	260	240	240	240	250	300	300	300	290	230
	05						10	210	270	250	250	240	200	200			220	300	230	270	250	250	250	250	300	300	300	270	240
	06						130	210	260	230	250	260	220	200			250	300	230	260	250	250	280	280	310	290	300	260	230
	07						250	230	230	230	250	260	230	190			260	310	230	260	250	250	280	290	300	300	300	250	220
	08						260	220	240	230	270	260	250	200			270	300	290	260	240	250	290	300	300	300	300	250	240
	09						300	220	240	230	310	280	250	190			280	290	270	270	250	280	290	300	300	300	290	250	310
	10						300	230	200	230	300	280	250	200			290	300	300	280	270	270	300	300	300	300	300	250	310
	11						280	250	200	220	310	280	240	200			280	290	300	260	280	250	280	300	290	300	300	240	300
	12						280	230	210	220	290	280	230	250			270	300	300	250	280	240	290	300	300	290	290	250	300
	13						270	230	240	230	290	290	200	260			280	300	280	270	280	240	290	290	300	300	290	250	280
	14						270	220	250	240	290	270	180	250			280	290	280	280	280	260	290	290	300	300	310	250	280
	15						270	220	260	250	280	250	190	270			280	300	280	290	300	280	290	300	300	300	300	240	290
	16						270	220	280	240	280	250	190	280			270	300	290	280	290	280	290	300	300	300	300	250	300
	17						270	220	250	230	270	250	210	260			280	290	300	280	290	270	270	280	300	300	300	250	270
	18						280	220	250	230	280	230	200	280			280	300	300	280	290	280	280	300	300	300	290	240	290
	19						250	200	260	220	280	220	210	270			300	290	280	280	290	270	280	300	300	290	300	250	290
	20						230	200	250	240	280	230	210	260			300	290	280	280	290	280	290	300	300	300	290	250	290
	21						230	210	250	230	280	230	220	260			290	290	270	270	280	270	290	300	290	290	300	250	300
							240	240	250	230	270	240	210	250			280	290	70	270	290	280	290	300	300	300	290	250	300
							230	250	240	240	270	240	210	240			300	300		280	280	280	290	300	300	300	290	250	300
	24						240	260	230	250	270	230	210	240			300	300		280	290	280	300	300	300	300	280	250	300
3.ÜNİTE	01			240	260	240	230	230	270	250	260	220	220	200	230	190				230	40								
	02			230	250	240	220	180	260	250	250	220	220	200	220	70				230	200								
	03			240	250	240	220	170	260	250	240	220	210	200	220					230	100								
	04			230	250	240	230	170	250	250	250	230	210	200	220					230	220								
	05			240	260	240	250	170	270	260	260	230	210	200	220					240	140								
	06			230	250	240	240	180	260	230	250	220	210	230	230					180	230								
	07			250	250	250	240	190	260	210	250	220	220	230	240					190	40								
	08			230	260	250	230	170	260	220	250	220	210	220	240					220									
	09			240	260	260	240	190	240	220	250	230	200	220	240					250									
	10			240	250	250	240	180	250	230	250	240	180	230	240					250									
	11			240	250	240	230	180	250	230	240	50	180	220	230					260									
	12			270	250	250	230	190	250	220	240		170	230	230					260									
	13			270	240	250	230	190	250	220	230		160	240	230					260									40
	14			270	240	250	240	190	250	230	230		160	240	240					260									80
	15			270	240	250	230	180	250	230	230	20	160	250	240				30	260									150
	16			260	240	250	230	190	250	220	230	180	160	250	120				190	250									180
	17			260	240	250	230	180	250	240	220	210	200	250					110	260									260
	18			260	240	250	230	200	240	240	230	210	190	250	50				230	250									270
	19			260	240	250	230	190	250	230	230	210	190	250	210				240	250									270
	20			260	240	230	230	180	250	230	230	200	200	230	230				240	260									270
				260	240	240	230	190	250	240	240	210	190	230	230				240	250									290
	22			250	250	230	220	240	250	250	240	210	200	240	230				230	250									300
	23			260	240	230	230	250	250	240	220	220	200	240	210				230	250									300
	24			250	240	230	230	270	250	250	220	210	190	240	200				230	250									300
4.ÜNİTE	01	300	300	260	240	270	250	250	260	270	260	260	220	190	270	270	260												
	02	300	300	260	250	280	240	250	240	280	250	250	220	190	230	270	270												
	03	300	300	260	250	270	230	210	240	290	250	250	220	190	220	280	280												
	04	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	250	220	220	230	280	280												
	05	300	300	230	240	280	250	210	250	280	260	260	200	220	230	280	280												
	06	290	300	230	250	280	250	220	260	240	250	260	220	230	240	280	280												
	07	290	310	230	270	280	240	230	270	220	250	270	240	230	260	270	280												
	08	290	160	230	280	280	240	220	270	240	280	260	240	230	280	280	280												
	09	300	100	260	260	280	230	250	260	220	280	290	210	220	280	250	270												
	10	300	120	270	260	270	240	250	260	220	280	300	200	190	280	280	260												
	11	300	30	250	270	280	240	250	270	230	280	280	190	240	270	280	250												
	12	280	30	260	270	270	230	250	280	220	280	290	190	250	280	280	230												
	13	290	190	250	260	280	230	250	270	220	270	300	170	260	270	280	250												
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	150	280	270	280	250												
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	160	280	280	280	250												
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	190	280	270	280	250												
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	200	280	290	280	220												
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	210	[illegible]	[illegible]	210	280	280	270													
		290	260	260	270	260	230	230	270	240	280	230	210	280	270	280													
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]													
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]													
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]													
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]													
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]													

NOT : 2. Ünite Türbin Kanat Arızası nedeniyle 17.06.2002 den beri devre dışıdır.

	SAA	MART																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1.ÜNİTE		300	290	280	270				240	250	250	280	280	260	260	300	[illegible]						190	270	270							
1.ÜNİTE	02	290	310	280	250			20	220	250	260	280	250	240	250	300	250						200	250	280							
1.ÜNİTE	03	300	270	250	250				220	250	280	290	250	240	250	300	250						220	250	250							
1.ÜNİTE	04	290	270	260	250			110	220	250	270	300	240	250	260	290	250						220	250	240							
1.ÜNİTE	05	300	250	250	260			200	220	240	270	270	250	250	260	290	250						180	250	250							
1.ÜNİTE	06	300	270	250	250			240	220	250	270	280	240	250	250	300	250						180	260	240							
1.ÜNİTE	07	300	270	250	230			240	220	240	270	280	250	240	250	300	250						220	250	240							
1.ÜNİTE	08	300	270	250	250			240	250	250	270	260	240	250	260	300	250						230	280	250							
1.ÜNİTE	09	290	240	220	270			240	300	250	270	270	250	270	260	300	260						270	250	280							
1.ÜNİTE	10	290	250	270	270			240	290	240	300	270	260	270	270	300	260						240	100	100							
1.ÜNİTE	11	300	260	260	270			240	280	250	300	270	260	240	280	290	230						250									
1.ÜNİTE	12	300	250	260	270			240	280	250	280	280	260	240	270	300	250						250									
1.ÜNİTE	13	290	260	280	270			250	290	260	250	280	260	220	270	300	230						260									
1.ÜNİTE	14	300	270	280	280			240	290	270	260	270	270	220	300	300	250						280									
1.ÜNİTE	15	290	300	280	280			240	280	280	260	280	260	230	280	310	250						280	10								
1.ÜNİTE	16	300	300	300	260			240	290	280	260	280	260	200	270	300	240						280	240								
1.ÜNİTE	17	290	300	280	230			240	280	270	260	280	260	250	300	290	210						280	220								
1.ÜNİTE	18	300	290	290	240			250	290	240	270	290	240	240	300	290	230						280	280								
1.ÜNİTE	19	300	300	270	230			240	280	250	260	300	250	240	300	280	230						280	300								
1.ÜNİTE	20	270	290	270	30			220	270	250	260	300	240	260	300	250	230						260	300								
1.ÜNİTE	21	270	300	270				210	240	240	260	280	230	250	300	250	220						280	300								
1.ÜNİTE		290	300	270				210	240	250	270	270	240	260	300	260	220					10	280	290								
1.ÜNİTE		270	300	260				200	250	250	260	280	260	250	290	250	30						270	300								
1.ÜNİTE	24	290	300	270				210	250	250	260	270	270	250	300	250							280	300								
3.ÜNİTE	01	290	300	300	270	250	260	240										250	280	280	250	250	180									
3.ÜNİTE	02	300	300	280	250	250	240	240										250	280	280	250	240										
3.ÜNİTE	03	300	290	260	250	240	240	250										250	280	290	260	250										
3.ÜNİTE	04	310	270	250	250	240	250	220										250	280	280	250	230										
3.ÜNİTE	05	300	260	280	240	240	240											250	280	290	260	220										
3.ÜNİTE	06	290	250	240	240	240	240											260	290	280	250	220										
3.ÜNİTE	07	290	260	250	260	240	240											260	280	280	260	230										
3.ÜNİTE	08	300	270	260	260	240	240											260	280	280	240	230										
3.ÜNİTE	09	290	290	260	240	240	240											270	280	280	160	250										
3.ÜNİTE	10	300	300	270	260	240	240											280	280	280	180	260										
3.ÜNİTE	11	270	280	270	270	240	240											270	280	290	200	260										
3.ÜNİTE	12	270	270	270	280	240	240											290	280	280	250	260										
3.ÜNİTE	13	270	290	280	300	230	240											290	280	290	250	260										
3.ÜNİTE	14	270	300	290	300	240	240											270	290	280	280	260										
3.ÜNİTE	15	260	300	290	290	240	260											280	280	280	280	270										
3.ÜNİTE	16	260	300	290	270	240	280											280	280	280	270	260										
3.ÜNİTE	17	260	300	280	250	250	270											270	290	280	260	260										
3.ÜNİTE	18	260	290	290	250	240	260											270	280	260	270	260										
3.ÜNİTE	19	260	300	290	240	250	270											270	290	250	270	270										
3.ÜNİTE	20	260	300	290	240	240	240											280	280	250	270	270										
3.ÜNİTE		260	300	280	250	240	250										10	280	280	250	260	260										
3.ÜNİTE	22	300	300	280	250	230	260										120	280	270	250	270	260										
3.ÜNİTE	23	300	300	270	260	240	270										200	280	260	250	270	260										
3.ÜNİTE	24	300	300	260	250	240	250										250	280	280	250	270	260										
4.ÜNİTE	01																			230	180	[illegible]	[illegible]	[illegible]	300	290	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.ÜNİTE	02																			250		230	230	220	250	300	270	0	260	260	250	280
4.ÜNİTE	03																			270		230	230	220	250	300	270	250	240	260	260	280
4.ÜNİTE	04																			250		230	220	220	250	300	270	240	240	[illegible]	[illegible]	[illegible]
4.ÜNİTE	05																			260		220	230	220	250	300	270	260	240	260	260	280
4.ÜNİTE	06																			250		230	220	210	250	300	240	270	230	260	260	280
4.ÜNİTE	07																			240		220	230	220	250	300	250	260	240	260	260	260
4.ÜNİTE	08																			250		230	220	220	270	300	250	250	230	260	280	280
4.ÜNİTE	09																			240		230	250	240	[illegible]	[illegible]	250	[illegible]	240	250	[illegible]	[illegible]
4.ÜNİTE	10																			240		230	250	250	[illegible]	[illegible]	250	[illegible]	240	[illegible]	[illegible]	[illegible]
4.ÜNİTE	11																			250		250	250	250	300	300	250	260	260	260	280	280
4.ÜNİTE	12																			250		250	250	250	290	290	250	260	260	250	280	280
4.ÜNİTE	13																			250		250	240	[illegible]	300	280	[illegible]	[illegible]	260	260	280	280
4.ÜNİTE	14																			[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		260	[illegible]	[illegible]	250	[illegible]	[illegible]
4.ÜNİTE	15																			[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.ÜNİTE	16																			[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.ÜNİTE	17																			240		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	270	200	[illegible]	[illegible]	[illegible]	[illegible]
4.ÜNİTE	18																			[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	250	[illegible]	[illegible]
4.ÜNİTE																				[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.ÜNİTE																						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.ÜNİTE	21																					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.ÜNİTE	22																							[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
4.ÜNİTE	23																										[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4.ÜNİTE	24																										[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOT : 2. Ünite Türbin Kanat Arızası nedeniyle 17.06.2002 den beri devre dışıdır.

	SAAT	NİSAN 1	2	3	4	5	6	7
1.ÜNİTE	01							
	02							
	03							
	04							
	05							
	06							
	07							
	08							
	09							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							50
	20							170
	21							210
	22							250
	23							280
	24							300
3.ÜNİTE	01				280	280	300	290
	02				270	260	290	300
	03				270	230	290	300
	04				280	280	290	300
	05				270	280	290	300
	06				270	270	290	290
	07				280	280	290	300
	08				270	280	290	300
	09				280	280	300	300
	10				270	280	300	290
	11				290	290	300	300
	12				280	280	300	300
	13				280	300	300	300
	14				280	300	290	300
	15				280	300	300	300
	16				280	300	300	300
	17				270	290	290	300
	18				280	300	300	300
	19				280	290	300	300
	20			[illegible]	280	300	300	290
	21			[illegible]	280	280	290	300
	22			[illegible]	280	280	300	300
	23			270	280	270	290	300
	24			[illegible]	280	280	300	300
4.ÜNİTE	01	280	[illegible]	[illegible]	270	270		
	02	280	270	[illegible]	270	260		
	03	280	270	[illegible]	270	250		
	04	280	270	250	270	270		
	05	280	270	[illegible]	270	270		
	06	280	290	270	250	270		
	07	280	270	270	270	270		
	08	280	280	[illegible]	270	270		
	09	270	250	240	250	270		
	10	280	[illegible]	[illegible]	280	270		
	11	280	[illegible]	[illegible]	270	270		
	12	280	[illegible]	[illegible]	270	250		
	13	280	[illegible]	[illegible]	270	250		
	14	280	[illegible]	[illegible]	270	250		
	15	280	[illegible]	[illegible]	280	260		
	16	[illegible]	[illegible]	250	270	250		
	17	[illegible]	[illegible]	270	260	250		
	18	[illegible]	[illegible]	[illegible]	260	250		
	19	[illegible]	[illegible]	[illegible]	270	250		
	20	[illegible]	[illegible]	[illegible]	270	250		
	21	[illegible]	[illegible]	[illegible]	270	220		
	22	[illegible]	[illegible]	[illegible]	270			
	23	[illegible]	[illegible]	[illegible]	260			
	24	[illegible]	[illegible]	[illegible]	270			

NOT : 2. Ünite Türbin Kanal Arızası nedeniyle 17.06.2002 den beri devre dışıdır.

ANNEX B12

FLORA AND FAUNA LISTS

Existing and Possible Flora Species at Surrounding and Impact Area of Afşin-Elbistan A Thermal Power Plant, Phytogeographical Regions, Endemism Status, Danger Categories, Relative Abundance and Habitats

Family and Species	Habitat	Endemism	Phytogeographical region	IUCN Red Data Book Categories	Relative Abundancy
ACANTHACEAE					
⊛ *Acanthus dioscoridis L. var. dioscoridis L.*	Fallowed field, steppe	-	East Mediterranean	-	2
⊛ *Acanthus hirsutus BOISS.*	Forest, steppe, Fallowed field	Endemic	-	LR (lc)	3
AMARANTHACEAE					
⊛ *Amaranthus blitoides S. WATS.*	Ruins, arid areas	-	-	-	3
AMARYLLIDACEAE					
✿ *Ixiolirion tataricum (PALLAS) HERBERT subsp. montanum (LABILL.) TAKHT.*	Rocky slope, planted field, fallowed field, side of ways	-	Irano.-Turanien.	-	3
✿ *Sternbergia clusiana (KER-GAWL.) KER-GAWL. EX SPRENGEL*	Rare forests	-	Irano.-Turanien.	-	4
⊛ *Sternbergia colchiciflora WALDST. ET KIT.*	Open areas, bushes	-	-	-	3
ANACARDIACEAE					
✿ *Cotinus coggyria SCOP.*	Maquis, bushes and forests	-	-	-	3
APIACEAE / UMBELLIFERAE					
✿ *Artedia squamata L.*	Slope, bushes, field sides	-	-	-	3
⊛ *Biforia radians BIEB.*	Empty area, field sides	-	-	-	4
✿ *Bunium ferulaceum SM.*	Forest, field, steppe	-	East Mediterranean	-	4
✿ *Bunium paucifolium DC. var. paucifolium DC.*	Fallowed field, steppe, grass, side of ways, rocky slope	-	Irano.-Turanien.	-	3
⊛ *Bupleurum gerardii ALL.*	Stony and rocky slope, fields	-	-	-	4
✿ *Caucalis platycarpos L.*	Fields, slopes, side of ways, arid areas	-	-	-	4
✿ *Chaerophyllum crinitum BOISS.*	Steppe, rocky slopes, fallowed fields	-	Irano.-Turanien.	-	4
✿ *Ferulago cassia BOISS.*	Rocky slope	-	East Mediterranean	-	4
✿ *Tordylium apulum L.*	Rocky slope, field, side of ways	-	Mediterranean	-	3
⊛ *Torilis arvensis (HUDS.) LINK subsp. arvensis (HUDS.) LINK*	Slopes, side of ways, arid areas	-	-	-	4
✿ *Torilis arvensis (HUDS.) LINK subsp. neglecta (SPRENGEL) THELLUNG*	Arid areas, fields	-	-	-	3
✿ *Torilis arvensis (HUDS.) LINK subsp. purpurea (TEN.) HAYEK*	Bushes, slope, field	-	Mediterranean	-	3
⊛ *Turgenia latifolia (L.) HOFFM.*	Arid areas, planted field	-	-	-	3
CUPRESSACEAE					
⊛ *Juniperus excelsa* BIEB.	Arid slopes	-	-	-	4
✿ *Juniperus foetidissima* WILLD.	Bushes	-	-	-	3
⊛ *Juniperus oxycedrus* L. subsp. oxycedrus L.	Pineforest, oak buses, maquis	-	-	-	4
ARACEAE					

Family and Species	Habitat	Endemism	Phytogeographical region	IUCN Red Data Book Categories	Relative Abundancy
☼ *Arum detruncatum C. A. MEYER var. detruncatum C. A. MEYER*	Rocky areas, steppe, side of ways, Quercus ve Juniperus bushes	-	East Mediterranean	-	4
⊛ *Arum detruncatum C. A. MEYER var. virescens (STAPF) K. ALPINAR ET R. MILL*	Rocky areas, steppe, side of ways, Quercus ve Juniperus bushes	-	Irano.-Turanien.	-	3
☼ *Biarum bovei BLUME*	Rocky areas, Quercus bushes, field	-	Irano.-Turanien.	-	4
⊛ *Eminium rauwolffii (BLUME) SCHOTT var. rauwolffii (BLUME) SCHOTT*	Rare stony hills, planted field, arid areas	-	Irano.-Turanien.	-	3
⊛ *Eminium rauwolffii (BLUME) SCHOTT var. kotschyi (SCHOTT) H. RIEDL*	Rare stony hills, planted field, arid areas	-	East Mediterranean	-	4
ASCLEPIADACEAE					
☼ *Cionura erecta (L.) GRISEB.*	Stony and rocky slope, water sides	-	East Mediterranean	-	4
ASTERACEAE / COMPOSITAE					
⊛ *Achillea biebersteinii AFAN.*	Forest, steppe, grass, rocky slope, fallowed field	-	Irano.-Turanien.	-	4
☼ *Achillea kotschyi BOISS. subsp. kotschyi BOISS.*	Stony slope, grass	-	-	-	4
⊛ *Achillea kotschyi BOISS. subsp. canescens BASLER*	Stony slope, grass	Endemic	East Mediterranean .	LR (lc)	4
☼ *Achillea nobilis L. subsp. neilreichii (KERNER) FORMANEK*	Forest, steppe, rocky slopes, grass, fallowed field	-	Europe-Siberian.	-	4
⊛ *Anthemis cretica L. subsp. tenuiloba (DC.) GRIERSON*	Steppe, sides of ways, water side	-	-	-	4
☼ *Anthemis cretica L. subsp. anatolica (BOISS.) GRIERSON*	Steppe, sides of ways, slope	-	-	-	4
⊛ *Anthemis cretica L. subsp. umbilicata (BOISS. ET HUET) GRIERSON*	Steppe, rocky slope	-	-	-	4
☼ *Anthemis tinctoria L. var. tinctoria L.*	Steppe, field, bushes	-	-	-	4
⊛ *Anthemis tinctoria L. var. pallida DC.*	Steppe, field side	-	-	-	3
☼ *Carduus nutans L. subsp. leiophyllus (PETR.) STOJ. ET STEF.*	Planted field, fallowed field, empty area	-	-	-	3
☼ *Carlina oligocephala BOISS. ET KOTSCHY subsp. oligocephala BOISS. ET MEY.*	Forest, steppe	-	-	-	3
☼ *Carthamus dentatus VAHL.*	Steppe, fallowed field	-	-	-	4
⊛ *Centaurea aggregata FISCH. ET MEY. EX DC. subsp. aggregata FISCH. ET MEY. EX DC.*	Rocky slope, forest	-	-	-	3
☼ *Centaurea aggregata FISCH. ET MEY. EX DC. subsp. albida (C. KOCH) BORNM.*	Rocky slope, forest	-	-	-	4
⊛ *Centaurea babylonica (L.) L.*	Forest, maquis, field side	-	East Mediterranean	-	4
☼ *Centaurea depressa BIEB.*	Field, sides of ways	-	-	-	4
⊛ *Centaurea solstitialis L. subsp. solstitialis L.*	Forest, arid slope, fallowed field, empty area	-	-	-	3
☼ *Chondrilla juncea L. var. juncea L.*	Rocky area, fallowed field	-	-	-	3
⊛ *Chondrilla juncea L. var. acantholepis (BOISS.) BOISS.*	Rocky area, fallowed field	-	-	-	3

Family and Species	Habitat	Endemism	Phytogeographical region	IUCN Red Data Book Categories	Relative Abundancy
☼ *Cicerbita mulgedioides (SCHULTZ BIP. EX VIS. ET PANC.) BEAUVERD*	Forest, bushy	-	-	-	3
☼ *Cirsium elodes BIEB.*	Grass, water side	-	Irano.-Turanien.	-	4
⊛ *Cirsium libanoticum DC. subsp. arachnoideum DAVIS ET PARRIS*	Grass, water side	-	Irano.-Turanien.	-	4
☼ *Cousinia foliosa BOISS. ET BAL.*	Arid slope, steppe	Endemic	Irano.-Turanien.	LR (lc)	4
⊛ *Crepis foetida L. subsp. foetida L.*	Maquis, planted field, forest	-	-	-	2
☼ *Crepis foetida L. subsp. rhoeadifolia (BIEB.) CELAK.*	Steppe, humid areas, forest, maquis	-	-	-	3
☼ *Crepis foetida L. subsp. commutata (SPRENG.) BABCOCK*	Forest, slope, slope, steppe, field side	-	-	-	3
⊛ *Crepis sancta (L.) BABCOCK*	Forest, rocky slope, steppe	-	-	-	4
⊛ *Doronicum orientale HOFFM.*	Forest and bushes	-	-	-	3
☼ *Gundelia tournefortii L. var. tournefortii L.*	Rocky slope, steppe, forest spaces, fallowed field	-	Irano.-Turanien.	-	4
☼ *Gundelia tournefortii L. var. tenuisecta BOISS.*	Rocky slope, steppe, forest spaces, fallowed field	-	Irano.-Turanien.	-	4
☼ *Gundelia tournefortii L. var. armata FREYN ET SINT.*	Rocky slope, steppe, forest spaces, fallowed field	-	Irano.-Turanien.	-	4
⊛ *Helichrysum armenium DC. subsp. armenium DC.*	Rocky slope, steppe, forest spaces, fallowed field	-	Irano.-Turanien.	-	3
⊛ *Helichrysum armenium DC. subsp. araxinum (KIRP.) TAKHT.*	Rocky slope, steppe, forest spaces, fallowed field	-	Irano.-Turanien.	-	3
☼ *Hieracium bornmuelleri FERYN*	Forest, grass, rocky areas	Endemic	-	LR (lc)	3
☼ *Leontodon oxylepis BOISS. ET HELDR. var. divaricatus (BOISS.) KUPICHA*	Forest, steppe	Endemic	Irano.-Turanien.	LR (lc)	4
☼ *Logfia arvensis (L.) HOLVB*	Forest spaces, bushes, stony slope, sides of ways, pasture, fallowed field	-	-	-	4
☼ *Micropus supinus L.*	Bares areas, sides of ways	-	Mediterranean	-	3
⊛ *Pilosella echioides (LUMN.) C. H. ET F. W. SCHULTZ subsp. procera (FRIES) SELL ET WEST*	Steppe, rocky area, forest, bushes	-	-	-	4
☼ *Reichardia glauca MATTHEWS*	Steppe, rocky slope	-	Irano.-Turanien.	-	3
☼ *Scorzonera cana (C. A. MEYER) HOFFM. var. jacquiniana (W. KOCH) CHAMBERLAIN*	Grass, field side	-	-	-	3
⊛ *Scorzonera incisa DC.*	Planted field, pasture	-	Irano.-Turanien.	-	3
⊛ *Senecio viscosus L.*	Rocky slope, planted field	-	-	-	3
⊛ *Sonchus asper (L.) HILL subsp. glaucescens (JORDAN) BALL*	Forest space, planted field	-	-	-	4
☼ *Tanacetum cadmeum (BOISS.) HEYWOOD subsp. cadmeum DC.*	Forest, slope, field side	Endemic	-	LR (lc)	3
⊛ *Tragopogon longirostis BISCH. EX SCHULTZ BIP. var. longirostis BISCH. EX SCHULTES*	Rocky slope, bushes, sides of ways, planted field	-	-	-	3

Family and Species	Habitat	Endemism	Phytogeographical region	IUCN Red Data Book Categories	Relative Abundancy
☼ *Tragopogon longirostis BISCH. EX SCHULTZ BIP. var. abbreviatus BOISS.*	Rocky slope, bushes, sides of ways, field	-	-	-	4
⊛ *Tripleurospermum callosum (BOISS. ET HELDR.) E. HOSSAIN*	Steppe, planted field, fallowed field, rocky slope	Endemic	-	LR (lc)	3
☼ *Tripleurospermum decipiens (FISCH. ET MEY.) BORNM.*	Steppe, planted field, fallowed field	-	-	-	3
☼ *Urospermum picroides (L.) F. W. SCHMIDT*	Bushes, empty areas	-	Mediterranean	-	4
⊛ *Xanthium spinosum L.*	Arid slope, empty area	-	-	-	3
⊛ *Xanthium strumarium L. subsp. strumarium L.*	Field side, empty area	-	-	-	3
☼ *Xanthium strumarium L. subsp. cavanillesii (SCHOUW) D. LÖVE ET P. DANSEREAU*	Field side, empty area	-	-	-	2
⊛ *Xeranthemum annuum L.*	Steppe, arid areas	-	-	-	3
⊛ *Xeranthemum inapertum (L.) MILLER*	Forest spaces, field side	-	-	-	3
BORAGINACEAE					
☼ *Arnebia densiflora (NORDM.) LEDEB.*	Rocky slope	-	Irano.-Turanien.	-	4
⊛ *Cynoglottis chetikiana VURAL ET KIT TAN subsp. paphlagonica (HAUSSKN. EX BORNM.) VURAL ET KIT TAN*	Rocky slope, forest	Endemic	-	LR (lc)	4
⊛ *Heliotropium dolosum DE NOT.*	Field, sides of ways, steppe	-	-	-	4
⊛ *Heliotropium europaeum L.*	Field side, sides of ways	-	Mediterranean	-	4
☼ *Lappula barbata (BIEB.) GÜRKE*	Steppe, stony slope, field side, arid areas	-	Irano.-Turanien.	-	4
⊛ *Myosotis alpestris F. W. SCHMIDT subsp. alpestris F. W. SCHMIDT*	Rocky slope, grass areas	-	-	-	4
☼ *Nonea macrosperma BOISS. ET HELDR.*	Fallowed field, grass, sides of ways, steppe	Endemic	Irano.-Turanien.	LR (lc)	4
⊛ *Nonea pulla (L.) DC. subsp. monticola RECH. FIL.*	Sides of ways, bushes	Endemic	-	LR (lc)	3
⊛ *Onosma armenum DC.*	Steppe, stony grass	Endemic	-	LR (lc)	4
☼ *Onosma giganteum LAM.*	Forest, fallowed field, field sides, maquis	-	East Mediterranean.	-	2
⊛ *Onosma tauricum PALLAS EX WILLD. var. tauricum PALLAS EX WILLD.*	Rocky, bushes, forest	-	-	-	4
⊛ *Onosma tauricum PALLAS EX WILLD. var. brevifolium DC.*	Rocky, bushes, forest, steppe	Endemic	-	LR (lc)	4
⊛ *Symphytum brachycalyx BOISS.*	Forest, shady areas, water side	-	East Mediterranean.	-	3
BRASSICACEAE CRUCIFERAE					
⊛ *Aethionema coridifolium DC.*	Stony rocky slope	-	-	-	5
☼ *Alyssum linifolium STEPH. EX WILLD. var. linifolium STEP. EX WILLD.*	Open areas	-	-	-	3

Family and Species	Habitat	Endemism	Phytogeographical region	IUCN Red Data Book Categories	Relative Abundancy
☼ *Alyssum linifolium STEPH. EX WILLD. var. teheranicum BORNM.*	Step	-	-	-	3
⊛ *Alyssum strigosum BANKS ET SOL. subsp. strigosum BANKS ET SOL.*	Bushes, steppe	-	-	-	4
⊛ *Capsella bursa-pastoris (L.) MEDIK.*	Planted area, empty area	-	-	-	3
☼ *Clypeola jonthlaspi L.*	Stony rocky slope	-	-	-	4
⊛ *Erysimum crassipes FISCH. ET MEY.*	Field side, rocky slope, fallowed field	-	-	-	4
☼ *Erysimum repandum L.*	Slope, fallowed field, empty area	-	-	-	3
☼ *Erysimum smyrnaeum BOISS. ET BAL.*	Rocky slope, planted area	-	-	-	3
⊛ *Isatis tinctoria L. subsp. tinctoria L.*	Bushes, empty area	-	-	-	3
⊛ *Isatis tinctoria L. subsp. tomentella (BOISS.) DAVIS*	Rocky slope, bushes, empty area	-	-	-	2
⊛ *Lepidium latifolium L.*	Field side	-	-	-	3
☼ *Lepidium sativum L. subsp. sativum L.*	Empty area, planted field	-	-	-	4
☼ *Lepidium sativum L. subsp. spinescens (DC.) THEL.*	Empty area, planted field	-	-	-	3
☼ *Myagrum perfoliatum L.*	Planted field, sides of ways	-	-	-	3
⊛ *Sisymbrium altissimum L.*	Planted field, ruins	-	-	-	3
⊛ *Sisymbrium loeselii L.*	Rocky slope, sides of ways, field side	-	-	-	3
CAMPANULACEAE					
⊛ *Asyneuma rigidum (WILLD.) GROSSH. subsp. rigidum (WILLD.) GROSSH.*	Forest, maquis, steppe, rocky slope	-	Irano-Turanien	-	2
☼ *Asyneuma rigidum (WILLD.) GROSSH. subsp. sibthorpianum (ROEMER ET SCHULTES) DAMBOLDT*	Forests, grass, rocky slope	Endemic	East Mediterranean	LR (lc)	4
⊛ *Campanula glomerata L. subsp. hispida (WITASEK) HAYEK*	Bushes, forest sides, pasture	-	Europe-Siberian	-	3
☼ *Campanula saxonorum GANDOGER*	Rocky slope, fallowed field	Endemic	Irano-Turanien	LR (lc)	3
⊛ *Michauxia campanuloides L'HERIT. EX AITON*	Rocky slope, rare stony areas	-	East Mediterranean	-	4
CARYOPHYLLACEAE					
⊛ *Saponaria glutinosa BIEB.*	Rocky slope, forest	-	-	-	3
☼ *Silene aegyptiaca (L.) L. FIL. subsp. aegyptiaca (L.) L. FIL.*	Slope, field, side of ways	-	-	-	4
⊛ *Silene kotschyi BOISS. var. kotschyi BOISS.*	Slope, field	-	-	-	3
⊛ *Silene otites (L.) WIBEL*	Steppe, field	-	-	-	3
CISTACEAE					
☼ *Fumana procumbens (DUN.) GREN. ET GODR.*	Rocky slope, steppe	-	-	-	4
CONVOLVULACEAE					
☼ *Convolvulus assyricus GRISEB.*	Rocky slope, steppe, fallowed field	Endemic	Irano.-Turanien	LR (lc)	4
⊛ *Convolvulus compactus BOISS.*	Forest, maquis, steppe	-	-	-	4
CYPERACEAE					
⊛ *Carex hirta L.*	Humid grass, side of ways, forest sides	-	Europe-Siberian	-	3

Family and Species	Habitat	Endemism	Phytogeographical region	IUCN Red Data Book Categories	Relative Abundancy
☼ *Schoenoplectus supinus* (L.) PALLA	Humid areas	-	-	-	4
EUPHORBIACEAE					
☼ *Euphorbia altissima BOISS. Var. altissima BOISS.*	Water side, field	-	Irano-Turanien	-	3
⊛ *Euphorbia falcata L. subsp. falcata L. var. falcata L.*	Forest side, maquis, frigana, rocky slope, steppe, humid areas	-	-	-	3
☼ *Euphorbia falcata L. subsp. falcata L. var. galilaea (BOISS.) BOISS.*	Forest side, maquis, frigana, rocky slope, steppe, humid areas	-	-	-	3
⊛ *Euphorbia falcata L. subsp. Macrostegia (BORNM.) O. SCHWARZ*	Forest, maquis, frigana, rocky slope, humid areas	-	East Mediterranean	-	3
ELAEAGNACEAE					
⊛ *Elaeagnus angustifolia* L.	River sides	-	-	-	4
FABACEAE / LEGUMINOSAE					
⊛ *Astragalus amblolepis FISCHER*	Steppe, pastures, rare woodland	-	Irano-Turanien	-	4
☼ *Astragalus gummifer LAB.*	Steppe, forest, pasture, hill slope	-	Irano-Turanien	-	4
⊛ *Astragalus macrocephalus WILLD. Subsp. Finitimus (BUNGE) CHAMBERLAIN*	Forest, steppe, stony slope	-	Irano-Turanien	-	4
☼ *Astragalus lamarckii BOISS.*	Steppe, side of ways	Endemic	Irano-Turanien	-	4
☼ *Astragalus tauricolus BOISS.*	Stony rocky slope	Endemic	Irano-Turanien	-	4
⊛ *Coronilla varia L. subsp. Varia L.*	Stony areas, forests, bushes, planted field	-	-	-	3
☼ *Hedysarum varium WILLD.*	Steppe, slope, fallowed field, planted areas	-	Irano-Turanien	-	4
☼ *Lathyrus aphaca L. var. affinis (GUSS.) ARC.*	Rocky slope, grass, field, river side, frigana	-	East Mediterranean	-	3
☼ *Lathyrus aphaca L. var. biflorus POST*	Field, humid areas, steppe, side of ways	-	-	-	3
⊛ *Medicago rigidula (L.) ALL. Var. rigidula (L.) ALL.*	Fallowed field, side of ways, steppe, forest	-	-	-	3
☼ *Medicago rigidula (L.) ALL. Var. cinerascens (JORD.) ROUY*	Fallowed field, side of ways, steppe, forest	-	-	-	3
⊛ *Medicago rigidula (L.) ALL. Var. submitis (BOISS.) HEYN*	Fallowed field, side of ways, steppe, forest	-	-	-	4
☼ *Medicago rigidula (L.) ALL. Var. agrestis BURNIAT*	Fallowed field, side of ways, steppe, forest	-	-	-	3
☼ *Melilotus officinalis (L.) DESR.*	Disturbed areas	-	-	-	3
☼ *Onobrychis cornuta (L.) DESV.*	Rocky slopes	-	Irano.-Turanien	-	4
⊛ *Onobrychis gracilis BESSER*	Fallowed field, steppe, stony and rocky areas	-	-	-	4

Family and Species	Habitat	Endemism	Phytogeographical region	IUCN Red Data Book Categories	Relative Abundancy
⊛ *Ononis adenotricha BOISS. Var. adenotricha BOISS.*	Rocky slopes, forest	-	East Mediterranean	-	3
⊛ *Ononis spinosa L. subsp. Antiquorum (L.) BRIQ.*	Stony slope, forest	-	Mediterranean	-	3
✡ *Ononis spinosa L. subsp. Leiosperma (BOISS.) SIRJ.*	Stony slope, forest, planted field	-	-	-	4
✡ *Trifolium purpureum LOIS. Var. purpureum LOIS.*	Field, stony areas, side of ways	-	-	-	3
✡ *Trigonella crassipes BOISS.*	Forest, steppe, fallowed field	-	Irano-Turanien	-	4
⊛ *Trigonella velutina BOISS.*	Rocky slope, steppe	-	Irano-Turanien	-	4
PINACEAE					
✡ *Abies cilicica (ANT. ET KOTSCHY) CARR. Subsp. Cilicica (ANT. ET KOTSCHY) CARR.*	Forest	-	East Mediterranean	-	3
✡ *Cedrus libani A. RICH*	Forest	-	Mediterranean	-	3
✡ *Pinus nigra ARN. Subsp. Pallasiana (LAMB.) HOLMBOE*	Forest	-	-	-	3
LEMNACEAE					
⊛ *Lemna gibba* L.	Lakes, ponds, wetlands, ditches, rivers	-	-	-	3
GENTIANACEAE					
✡ *Centaurium erythraea RAFN subsp. Erythraea RAFN*	Rocky slope, bushes, rare forest	-	Europe-Siberian	-	3
✡ *Centaurium erythraea RAFN subsp. Turcicum (VELEN.) MELDERIS*	Water side, rare forest areas, grass	-	-	-	3
⊛ *Centaurium erythraea RAFN subsp. Rumelicum (VELEN.) MELDERIS*	Rare forests	-	Mediterranean	-	3
PLUMBAGINACEAE					
⊛ *Acantholimon acerosum (WILLD.) BOISS. Var. acerosum (WILLD.) BOISS.*	Stony rocky slope, steppe	-	Irano-Turanien.	-	3
✡ *Acantholimon libanoticum BOISS.*	Stony rocky slope	-	Mediterranean	-	3
✡ *Acantholimon venestum BOISS. Var. venustum BOISS.*	Rocky slope, steppe, forest	-	Irano-Turanien	-	3
⊛ *Acantholimon venestum BOISS. Var. laxiflorum (BOISS. EX BUNGE) BOKHARI*	Rocky slope, steppe, forest	-	Irano-Turanien	-	3
JUNCACEAE					
✡ *Juncus alpinus VILL. Subsp. Alpinus VILL.*	River sides	-	-	-	3
⊛ *Juncus bufonius L.*	River sides	-	-	-	3
GUTTIFERAE					
⊛ *Hypericum elongatum LEDEB. Subsp. Apiculatum ROBSON*	Grass, rocky slope, forest	-	Irano-Turanien	-	3
⊛ *Hypericum elongatum LEDEB. Subsp. Microcalycinum (BOISS. ET HELDR.) ROBSON*	Steppe, forest openings	-	Irano-Turanien	-	3
POTAMOGETONACEAE					
✡ *Potamogeton berchtoldii FIEBER*	River sides	-	-	-	3
✡ *Potamogeton nodosus POIRET*	River sides	-	-	-	3
⊛ *Potamogeton panormitanus BIV.*	River sides	-	-	-	3

Family and Species	Habitat	Endemism	Phytogeographical region	IUCN Red Data Book Categories	Relative Abundancy
IRIDACEAE					
☼ *Crocus kotschyanus C. KOCH subsp. Kotschyanus C. KOCH*	Open areas, bushes	-	-	-	3
⊛ *Crocus pallasii GOLDB. Subsp. Pallasi GOLDB.*	Open areas, stony places, bushes	-	-	-	3
☼ *Crocus pallasii GOLDB. Subsp. Turcicus MATHEW*	Open areas, stony places, bushes	-	-	-	3
⊛ *Crocus pallasii GOLDB. Subsp. Dispathaceus (BOWLES) MATHEW*	Open areas, stony places, bushes	-	-	-	3
LAMIACEAE LABIATAE					
☼ *Ajuga chamaepitys (L.) SCHREBER subsp. Chia (SCHREBER) ARCANGELI var. chia (SCHREBER) ARCANGELI*	Stony slope, steppe, fallowed field	-	-	-	3
☼ *Ajuga chamaepitys (L.) SCHREBER subsp. Chia (SCHREBER) ARCANGELI var. ciliata BRIQ.*	Stony slope, steppe, fallowed field	-	-	-	3
⊛ *Lallemantia peltata (L.) FISCH. ET MEY.*	Stony slope, steppe, fallowed field, sides of ways	-	Irano-Turanien	-	3
☼ *Marrubium astracanicum JACQ. Subsp. Astracanicum JACQ.*	Slope, forest areas, side of ways	-	-	-	3
⊛ *Marrubium cephalanthum BOISS. ET NOE*	Slope, forestl areas, side of ways	Endemic	Irano-Turanien	LR (lc)	3
⊛ *Nepeta betonicifolia C. A. MEYER*	Stony slope, grass, fallowed field	-	Irano-Turanien	-	3
☼ *Salvia napifolia JACQ.*	Stony slope, maquis, sides of ways	-	East Mediterranean	-	3
☼ *Salvia russellii BENTHAM*	Rocky slope, planted field, fallowed field	-	Irano-Turanien	-	3
⊛ *Salvia verticillata L. subsp. Amasiaca (FREYN ET BORNM.) BORNM.*	Rocky slope, forest, sides of ways	-	Irano-Turanien	-	3
☼ *Stachys annua (L.) L. subsp. Annua (L.) L. var. lycaonica BHATTACHARJEE*	Agricultural area, fallowed field, forest	-	Irano-Turanien	-	3
⊛ *Stachys annua (L) L. subsp. Annua (L.) L. var. annua (L.) L.*	Slope, forest, fallowed field	-	-	-	3
☼ *Teucrium chamaedrys (CELAK.) RECH. FIL. Subsp. Sinuatum (CELAK.) RECH. FIL.*	Slope, steppe, sides of ways, field sides	-	Irano-Turanien.	-	3
☼ *Ziziphora capitata L.*	Kuru açık areas, Stony slopes, steppe	-	Irano-Turanien	-	3
LINACEAE					
⊛ *Linum tenuifolium L.*	Limestone slopes, steppe, bushes slopes and forests	-	-	-	4
MALVACEAE					
☼ *Malva neglecta WALLR.*	Steppe, field, side of ways	-	-	-	3
ORCHIDACEAE					
☼ *Dactylorhiza incarnata* (L.) SOO	Grass, humid areas, water sides	-	-	-	4
PAPAVERACEAE					
☼ *Fumaria asepala BOISS.*	Field, slope	-	Irano-Turanien	-	4
⊛ *Glaucium corniculatum (L.) RUD. Subsp. corniculatum (L.) RUD.*	Slope	-	-	-	4

Family and Species	Habitat	Endemism	Phytogeographical region	IUCN Red Data Book Categories	Relative Abundancy
⊛ *Glaucium corniculatum (L.) RUD. subsp. refractum (NAB.) CULLEN*	Steppe, field	-	Irano-Turanien	-	4
☼ *Papaver persicum LINDL. subsp. fulvum KIT TAN ET SORGER*	Rocky slope, stony steppe	-	Irano.-Turanien.	-	4
⊛ *Papaver syriacum BOISS. ET BLANCHE*	Field	-	-	-	4
PLANTAGINACEAE					
☼ *Plantago major L. subsp. major L.*	Water sides, sides of ways, planted arazi, pasture	-	-	-	4
POACEAE					
☼ *Aegilops biuncialis VIS.*	Rocky slope, forest openings, steppe, field side	-	-	-	3
⊛ *Aegilops speltoides TAUSCH var. speltoides TAUSCH*	Bushes, fallowed field, field side	-	-	-	3
☼ *Aegilops speltoides TAUSCH var. ligustica (SAVIGNONE) BORNM.*	Bushes, field side	-	-	-	3
☼ *Bothriochloa ischaemum* (L.) KENG	Bushesslope, steppe, field, sides of ways	-	-	-	3
⊛ *Bromus japonicus THUNB. subsp. japonicus THUNB.*	Planted lands, fallowed field, slopes	-	-	-	4
☼ *Bromus japonicus THUNB. subsp. anatolicus (BOISS. ET HELDR.) PENZES*	Planted lands, fallowed lands, steppe, dry slopes	-	-	-	3
⊛ *Bromus tectorum L.*	Open lands	-	-	-	3
☼ *Phleum boissieri BORNM.*	Bushes, rocky slope, fallowed field	-	Irano-Turanien	-	3
⊛ *Poa bulbosa L.*	Steppe, kuru grass, rocky slope, maquis	-	-	-	3
☼ *Poa nemoralis L.*	Pasture, rocky areas	-	-	-	3
⊛ *Stipa arabica TRIN. ET RUPR.*	Slope	-	Irano-Turanien	-	3
☼ *Stipa holosericea TRIN.*	Steppe, kuru areas, rocky slope	-	Irano-Turanien	-	3
☼ *Taeniatherum caput-medusae (L.) NEVSKI subsp. asper (SIMONKAI) MELDERIS*	Steppe, fallowed field, sides of ways	-	-	-	3
☼ *Taeniatherum caput-medusae (L.) NEVSKI subsp. crinitum (SCHREBER) MELDERIS*	Steppe, slope	-	Irano-Turanien	-	3
POLYGONACEAE					
☼ *Polygonum bellardii* ALL.	Field, disturbe areas, humid areas	-	-	-	3
☼ *Rumex patientia L.*	Field, slope, sides of ways	-	-	-	4
⊛ *Rumex tuberosus L. subsp. tuberosus L.*	Field, forest	-	-	-	4
⊛ *Rumex tuberosus L. subsp. creticus (BOISS.) RECH.*	Open areas, ruins	-	-	-	3
⊛ *Rumex tuberosus L. subsp. horozontalis (KOCH) RECH.*	Slope, field, bushes	-	-	-	4
PRIMULACEAE					
☼ *Anagallis arvensis L. var. arvensis L.*	Planted arazi, water side, rocky slope	-	-	-	3
☼ *Anagallis arvensis L. var. caerulea (L.) GOUAN*	Planted arazi, rocky slope, bushes	-	-	-	4
RANUNCULACEAE					
☼ *Consolida hellespontica (BOISS.) CHATER*	Planted field, fallowed field	-	-	-	3

Family and Species	Habitat	Endemism	Phytogeographical region	IUCN Red Data Book Categories	Relative Abundancy
☼ *Nigella arvensis L. var. glauca BOISS.*	Steppe, empty area , field	-	-	-	3
ROSACEAE					
⊛ *Crataegus monogyna JACQ. subsp. monogyna JACQ.*	Hill sides, maquis, oak bushes, forest, side of ways	-	-	-	4
⊛ *Pyrus elaeagnifolia PALLAS subsp. elaeagnifolia PALLAS*	Forest, field	-	-	-	4
⊛ *Rosa canina L.*	Rocky slope, bushes, forest, forest space	-	-	-	4
RUBIACEAE					
☼ *Asperula setosa JAUB. ET SPACH*	Dry slope, fields	-	-	-	3
⊛ *Galium penicillatum BOISS.*	Stony areas	-	East Mediterranean.	-	3
⊛ *Galium verum L. subsp. glabrescens EHREND.*	Rocky slope, bushy, planted areas	-	Irano-Turanien	-	3
TYPHACEAE					
⊛ *Typha domingensis PERS.*	River sides	-	-	-	4
⊛ *Typha latifolia L.*	River sides	-	-	-	4
SALICACEAE					
☼ *Populus euphratica* OLIV.	River sides	-	-	-	4
☼ *Populus nigra* L. subsp. nigra L.	River sides	-	-	-	4
☼ *Salix excelsa J. F. GMELIN*	Water side	-	Irano-Turanien	-	4
SCROPHULARIACEAE					
☼ *Anarrhinum orientale BENTHAM*	Rocky slope, steppe	-	Irano-Turanien	-	3
⊛ *Linaria genistifolia (L.) MILLER subsp. genistifolia (L.) MILLER*	Bushy, maquis, slope, sides of ways	-	Europe-Siberian	-	3
⊛ *Linaria genistifolia (L.) MILLER subsp. confertiflora (BOISS.) DAVIS*	Rocky slope, grass, fallowed field	Endemic	Irano-Turanien	LR (lc)	3
⊛*Scrophularia xanthoglossa BOISS. var. decipiens (BOISS. ET KOTSCHY) BOISS.*	Rocky slope, steppe, field sides, side of ways	-	Irano-Turanien	-	4
⊛ *Verbascum cheiranthifolium BOISS. var. cheiranthifolium BOISS.*	Forest, bushes, steppe	-	-	-	3
⊛ *Verbascum glomeratum BOISS.*	Bushes, forest, steppe	-	Irano-Turanien	-	3
VALERIANACEAE					
⊛ *Valeriana sisymbriifolia VAHL.*	Rocky slope, shady areas	-	Irano-Turanien	-	3
SPARGANIACEAE					
☼ *Sparganium erectum L. subsp. microcarpum (NEUMAN) DOMIN*	River sides	-	Europe-Siberian	-	3
☼ *Sparganium erectum L. subsp. neglectum (BEEBY) K. RICHTER*	River sides	-	Europe-Siberian	-	3
VERBENACEAE					

Family and Species	Habitat	Endemism	Phytogeographical region	IUCN Red Data Book Categories	Relative Abundancy
⊛ *Verbena officinalis L.*	Dirturbed area, rocky areas, dry river, forest , bushes	-	-	-	3
FAGACEAE					
✪ *Quercus cerris L. var. cerris L.*	Forest	-	Mediterranean	-	3
✪ *Quercus petraea (MATTUSCHKA) LIEBL. subsp. pinnatiloba (C. KOCH) MENITSKY*	Forest	Endemic	-	-	3

Relative Abundancy: 1 Rarer, 2 Uncommon, 3 Relatively Abundant, 4 Abundant, 5 Pure Population

⊛ Observation ✪ Literature

Existing and Possible Amphibian Species at Surrounding and Impact Area of Afşin-Elbistan A Thermal Power Plant

No of Specie	Family and Specie	Habitat	IUCN	Red Data Book	Bern
	HYLİDAE				
1	*(D) Hyla arborea arborea*	On the trees and bushes	LR/nt	nt	II
	RANIDAE				
2	*(G) Rana ridibunda ridibunda*	In the water and water sides	-	nt	III
	BUFONİDAE				
3	*(L) Bufo viridis*	In the stones and in the soil	-	nt	II

Source: Demirsoy, A., 1996, Türkiye Omurgalıları "Amfibiler", Çevre Bakanlığı Çevre Koruma Genel Müdürlüğü, Proje No: 90-K-1000-90. Ankara.
G: Observation L: Literature D: Survey

Existing and Possible Reptile Species at Surrounding and Impact Area of Afşin-Elbistan A Thermal Power Plant

No of Specie	Family and Specie	Bern	Red Data Book	IUCN	AKK (*)	Habitat
	TESTUDINIDAE					
1	*(G) Testudo graeca ibera*	II	nt	VUA1cd	Annex-I	Sandy, gravely and dry lands
	GEKKONİDAE					
2	*(L) Hemidactylus turcicus turcicus*	III	nt	-	Annex-I	Houses and ruins, rocks, under the stones
	AGAMIDAE					
3	*(G) Agama stellio stellio*	II	nt	-	Annex-I	Rock and stony places
4	*(G) Agama ruderata ruderata*	III	nt	-	Annex-I	Stony areas and soils
	SCINCIDAE					
5	*(L) Mabuya aurata*	III	nt	-	Annex-I	Stony places with rare vegetation
	LACERTİDAE					
6	*(L) Lacerta trilineata media*	II	nt	-	Annex-I	Stony areas of field and gardens, places with abundant plants, sometimes forest sides
7	*(L) Ophisops elegans elegans*	II	nt	-	Annex-I	Open areas with very rare vegetation and stony areas
	TYPHLOPİDAE					
8	*(L) Typhlops vermicularis*	III	nt	-	Annex-I	In the soils, under the stones
	COLUBRİDAE					
9	*(L) Coluber najadum*	II	nt	-	Annex-I	Stony and bushes in hot places
10	*(L) Coluber ravergieri nummifer*	III	nt	-	Annex-I	Stony and bushes in hot places
11	*(D) Coluber schmidti*	III	nt	-	Annex-I	Plains, water sides, field, gardens, under stones
12	*(L) Eirenis modestus*	III	nt	-	Annex-I	Open areas with very rare vegetation and stony areas
13	*(L) Elaphe quatuorlineata sauromates*	II	nt	-	Annex-I	Woodland, bushes and stony areas, field and garden
14	*(L) Elaphe hohenacheri hohenacheri*	III	nt	-	Annex-I	Woodland, bushes and stony areas, field and garden
15	*(D) Natrix natrix persa*	III	nt	-	Annex-I	Stony places and water
16	*(D) Natrix tessellata tessellata*	II	nt	-	Annex-I	In the water and water sides

Source: Demirsoy, A., 1996, Türkiye Omurgalıları "Sürüngenler", Çevre Bakanlığı Çevre Koruma Genel Müdürlüğü, Proje No: 90-K-1000-90. Ankara.
(*)=Ministry of Environment and Forestry, General Directorate of Nature Conservation and National Parks "2004-2005 Hunting Period Central Hunting Commission Decisions"

G: Observation L: Literature D: Survey

Existing and Possible Bird Species at Surrounding and Impact Area of Afşin-Elbistan A Thermal Power Plant

No of Specie	Family and Specie	Habitat	Spread in Turkey	Red Data Book	Bern	Status	AKK (*)
	ACCIPITRIDAE						
1	*(L) Aquila heliaca*	Forest and steppes, plains	BB	A. 2	II	Y,KZ	Annex-I
2	*(L) Aquila nipalensis*	Hill and bushes	Ma, Kd, A, I, Da, GDa	A. 1.2	II	Y,KZ	Annex-I
3	*(L) Buteo buteo*	Forest, field and grasses	BB	A. 3	II	Y,KZ,T	Annex-I
4	*(L) Buteo rufinus*	Hills and bushes	BB	A. 2	II	Y,KZ	Annex-I
5	*(L) Accipiter nisus*	Forests, park and gardens	Ma, Kd, E, A, I, Da	A. 4	II	Y,KZ	Annex-I
6	*(L) Circus aeruginosus*	Wetlands and bushes	Ma, Kd, E, A, I, Da	A. 3	II	Y	Annex-I
7	*(L) Circus cyaneus*	Wetlands, fields, flat and hill areas	Ma, Kd, E, A, I, Da	A. 3	II	Y,KZ	Annex-I
	FALCONIDAE						
8	*(D) Falco tinnunculus*	Settlement areas and forests	BB	A. 4	II	Y	Annex-I
9	*(L) Falco peregrinus*	Forests and open areas	BB	A. 2	II	Y,KZ	Annex-I
10	*(L) Falco subbeteo*	Woodlands, forest sides	BB	A.3	II	G	Annex-I
11	*(L) Falco naumannii*	Plains, high mountains and ruins	BB	A.3	II	G	Annex-I
12	*(L) Falco biarmicus*	Open plains and stony lands	BB	A.2	II	Y,T	Annex-I
	PHASIANIDAE						
13	*(G) Alectoris chukar*	Rocky and stony places	Ma, Kd, E, I, Da	A.2	III	Y	Annex-III
14	*(D) Coturnix coturnix*	Planted fields, grasses and steppes	BB	A.4	III	Y,G	Annex-III
15	*(D) Perdix perdix*	Field, grasses and rocky places	Ma, Kd, E, I, Da	A.3	III	Y	Annex-II
	COLUMBIDAE						
16	*(G) Columba palambus*	Settlement places and woodlands	BB	A.4	-	Y	Annex-III
17	*(D) Columba livia*	Forests, rocky areas	BB	-	III	Y	Annex-III
18	*(D) Streptopelia turtur*	Settlement places and agricultural areas	BB	A.2	III	G	Annex-III
19	*(D) Streptopelia decaocto*	Settlement places and agricultural areas	BB	-	III	Y	Annex-II
	STRIGIDAE						
20	*(L) Athena noctua*	Field, garden, forests and rocky areas	BB	A. 3	II	Y	Annex-I
21	*(L) Osio otus*	Park, garden, forests	BB	A. 2	II	Y	Annex-I
22	*(L) Otus scops*	Park, garden, forests	BB	A. 3	II	Y	Annex-I
	SCOLOPACIDAE						
23	*(L) Scolopax rusticola*	Forest and bushes	Ma, Kd, E, A, I, Da	A. 3	III	Y,KZT	Annex-III
	APODIDAE						
24	*(L) Apus apus*	Settlement places, rocky areas, woodlands	BB	A. 4	III	G,T	Annex-I
25	*(L) Apus melba*	Rocky slopes	BB	A. 4	II	G,T	Annex-I
	PICIDAE						
26	*(L) Dendrocopus syriacus*	Forests, gardens	BB	A. 3	II	Y	Annex-I
	ALAUDIDAE						
27	*(D) Galerida cristata*	Steppes and stony slopes	BB	-	III	Y	Annex-II
28	*(D) Alauda arvensis*	Field, open areas, trees and mountains	Ma, Kd, E, A, I, Da	-	III	Y	Annex-II

No of Specie	Family and Specie	Habitat	Spread in Turkey	Red Data Book	Bern	Status	AKK (*)
29	*(L) Melanocorypha calandra*	Fields	Ma, E, A, İ, Da, GDa	-	II	Y	Annex-I
30	*(L) Eremophila alpestris*	Open places, fields and empty areas	BB	A.3	II	Y	Annex-I
	HIRUNDINIDAE						
31	*(G) Hirundo rustica*	Settllement places	BB	-	II	G	Annex-I
32	*(G) Delichon urbica*	Setlement places and stony areas	BB	A.4	II	G	Annex-I
	TURDIDAE						
33	*(L) Erithacus rubecula*	Woodlands, park and gardens	BB	-	II	Y	Annex-I
34	*(D) Luscinia megarhynchos*	Woodlands, park and graves	BB	A. 3	III	G	Annex-I
35	*(L) Turdus pilaris*	Woodlands and grasses	BB	-	III	KZ	Annex-II
36	*(D) Turdus merula*	Woodlands and gardens	BB	-	III	Y	Annex-III
37	*(L) Turdus viscivorus*	Forests, settlement places, gardens	BB	-	III	Y	Annex-II
38	*(L) Saxicola torquata*	Stony and arid hills, mountains, woodlands and sandy places	BB	-	II	Y	Annex-I
39	*(L) Oenanthe oenanthe*	Open areas, field and grasses	BB	A. 3	II	G	Annex-I
40	*(L) Oenanthe hispanica*	Open areas, woodlands	BB	-	II	G, T	Annex-I
41	*(L) Phoenicurus phoenicurus*	Park, garden and woodlands	BB	-	II	Y	Annex-I
42	*(L) Phoenicurus ochruros*	Rocky areas, settlement places and ruins	BB	-	II	G	Annex-I
	MOTACILLIDAE						
43	*(L) Motacilla alba*	Open areas and water sides	BB	A. 4	II	Y	Annex-I
44	*(L) Motacilla flava*	Water sides, grassy areas, wetlands	BB	-	II	G	Annex-I
	SYLVIDAE						
45	*(L) Cettia cetti*	Water sides	BB	A.4	II	Y	Annex-I
46	*(L) Hippolais pallida*	Open areas, woodlands, gardens	BB	-	II	G	Annex-I
47	*(L) Sylvia communis*	Bushes, woodlands, forests and parks	BB	-	II	G	Annex-I
48	*(L) Sylvia hortensis*	Forests, gardens, mountains and plains	BB	-	II	G	Annex-I
49	*(L) Sylvia borin*	Bushes, forest, park and garden	BB	-	II	T	Annex-I
50	*(L) Phylloscopus trochilus*	Water sides, forest, garden, parks		-	II	T	Annex-I
51	*(L) Acrocephalus schoenobaenus*	Wetlands and lake sides	Kd, E, A, İ, Da	-	II	Y	Annex-I
	MUSCIPIDAE						
52	*(L) Muscicapa striata*	Settlement places, woodlands	BB	-	II	G	Annex-I
	PARIDAE						
53	*(L) Parus major*	Woodlands, park and gardens	BB	-	II	Y	Annex-I
54	*(L) Parus caeruleus*	Woodlands, park and gardens	BB	-	II	Y	Annex-I
	CORVIDAE						
55	*(L) Corvus monedula*	Woodlands, rocky places and ruins	BB	-	-	Y	Annex-III
56	*(G) Corvus corax*	Woodlands and stockbreeding places	BB	-	-	Y	Annex-II
57	*(L) Corvus corone cornix*	Open areas and fields	BB	-	-	Y	Annex-III
58	*(G) Pica pica*	Rare woodlands, park and gardens	BB	-	-	Y	Annex-III
	LANIIDAE						
59	*(L) Lanius collurio*	Open areas, park and gardens	BB	-	II	G	Annex-I

No of Specie	Family and Specie	Habitat	Spread in Turkey	Red Data Book	Bern	Status	AKK (*)
60	*(L) Lanius minor*	Forest sides, park and gardens	BB	-	II	T,G	Annex-I
	PASSERIDAE						
61	*(G) Passer domesticus*	Settlement places and fields	BB	-	-	Y	Annex-III
62	*(L) Passer montanus*	Forest, settlement places, park and gardens	BB	-	III	Y	Annex-II
	STURNIDAE						
63	*(D) Sturnus vulgaris*	Settlement places, field, forest	BB	-	-	Y	Annex-II
64	*(D) Sturnus roseus*	Pastures and stony places	BB	-	II	G	Annex-I
	FRINGILLIDAE						
65	*(L) Fringilla coelebs*	Woodlands, park and gardens	BB	-	III	Y	Annex-II
66	*(L) Carduelis chloris*	Woodlands, park and gardens,	BB	A. 4	II	Y	Annex-I
67	*(L) Carduelis cannabina*	Woodlands, park and gardens, forest	BB	A. 4	II	Y, KZ	Annex-I
68	*(L) Serinus serinus*	Park and gardens, water sides	BB	-	II	Y	Annex-I
69	*(D) Carduelis carduelis*	Woodlands and gardens	BB	A. 4	II	Y	Annex-I
	EMBERIZIDAE						
70	*(L) Emberiza melanocephala*	Woodlands, plains, gardens	BB	A. 3	II	G	Annex-I
71	*(L) Emberiza calandra*	Open areas, woodlands and fields	BB	-	III	Y	Annex-II
72	*(L) Emberiza horluna*	Woodlands, planted fields, forests	BB	A.3	III	G	Annex-II

Source: Demirsoy, A., 1997, Omurgalılar "Sürüngenler, Kuşlar ve Memeliler" Meteksan A.Ş., Ankara.
: Kiziroğlu, İ, 1993, The Birds of Türkiye (Species List in Red Data Book), TTKD, Ankara.
(*)=Ministry of Environment and Forestry, General Directorate of Nature Conservation and National Parks "2004-2005 Hunting Period Central Hunting Commission Decisions"

G: Observation L: Literature D: Survey

Spread of Bird Species:

Ma : Marmara Region
Kd : Black Sea Region
E : West Anatolia
A : South Anatolia
I : Middle Anatolia
Da : East Anatolia
GDa : Southeast Anatolia
BB : All regions

Existing and Possible Mammalian Species at Surrounding and Impact Area of Afşin-Elbistan A Thermal Power Plant

No of Spe cie	Family and Specie	Bern	Red Data Book	AKK (*)	IUCN	Habitat
	ERİNACEİDAE					
1	*(G) Erinaceus europaeus*	III	nt	Annex-I	-	Rare forests, settlement places, fields, gardens
	LEPORIDAE					
2	*(G) Lepus europaeus*	III	nt	Annex-III	-	Forest, bushes and rocky places
	VESPERTILIONIDAE					
3	*(L) Pipistrellus pipistrellus*	III	V	-	-	Several senvironment
	CRICETIDAE					
4	*(L) Cricetulus migratorius*	-	nt	-	LR/nt	Grass, field and steppes
5	*(L) Microtus quentheri*	-	nt	-	-	Dry areas
6	*(D) Arvicola terrestris*	-	nt	-	-	Water sides
	SPALACIDAE					
7	*(D) Spalax leucodon*	-	nt	-	VU D2	Galleries in the soil
	MURIDAE					
8	*(L) Rattus norvegicus*	-	nt	-	-	Each environment
9	*(L) Apodemus mystacinus*	-	nt	-	-	Stony and rocky areas
	CANIDAE					
10	*(D) Vulpes vulpes*	-	nt	Annex-III	LR/nt	Forest ve bushy areas, fields, open areas
11	*(D) Canis lupus*	II	R	Annex-I	-	Forest, step, open areas
	RHINOLOPHIDAE					
12	*(L) Rhinolophus ferrumequinum*	II	V	Annex-I	LR/cd	Forest, woodlands and bushes
13	*(L) Rhinolophus hipposideros*	II	V	Annex-I	VUA2 c	Forest, woodlands and bushes
	SORICIDAE					
14	*(L) Crocidura leucodon*	III	nt	-	-	Open areas and bushes
	MUSTELIDAE					
15	*(G) Mustela nivalis*	III	nt	Annex-II	-	Each environment
16	*(G) Meles meles*	III	nt	Annex-II	-	Forest, grass, field, step
	SCIURIDAE					
17	*(G) Citellus xanthophrymnus*	-	nt	-	-	Steppes and grasses
18	*(L) Sciurus anomalus*	II	nt	-	LR/nt	Forests
	URSIDAE					
19	*(A) Ursus arctos*	II	V	Annex-I	-	Forests
	SUIDAE					
20	*(A) Sus scrofa scrofa*	-	nt	Annex-III	-	Forests

Source: Demirsoy, A., 1996, Türkiye Omurgalıları "Memeliler", Çevre Bakanlığı Çevre Koruma Genel Müdürlüğü, Proje No: 90-K-1000-90. Ankara.
(*)=Ministry of Environment and Forestry, General Directorate of Nature Conservation and National Parks "2004-2005 Hunting Period Central Huntin Commision Decisions"
G: Observation L: Literature D: Survey

ANNEX B13

AIR QUALITY DISPERSION MODELING GRAPHS

NOTES AND REFERENCES

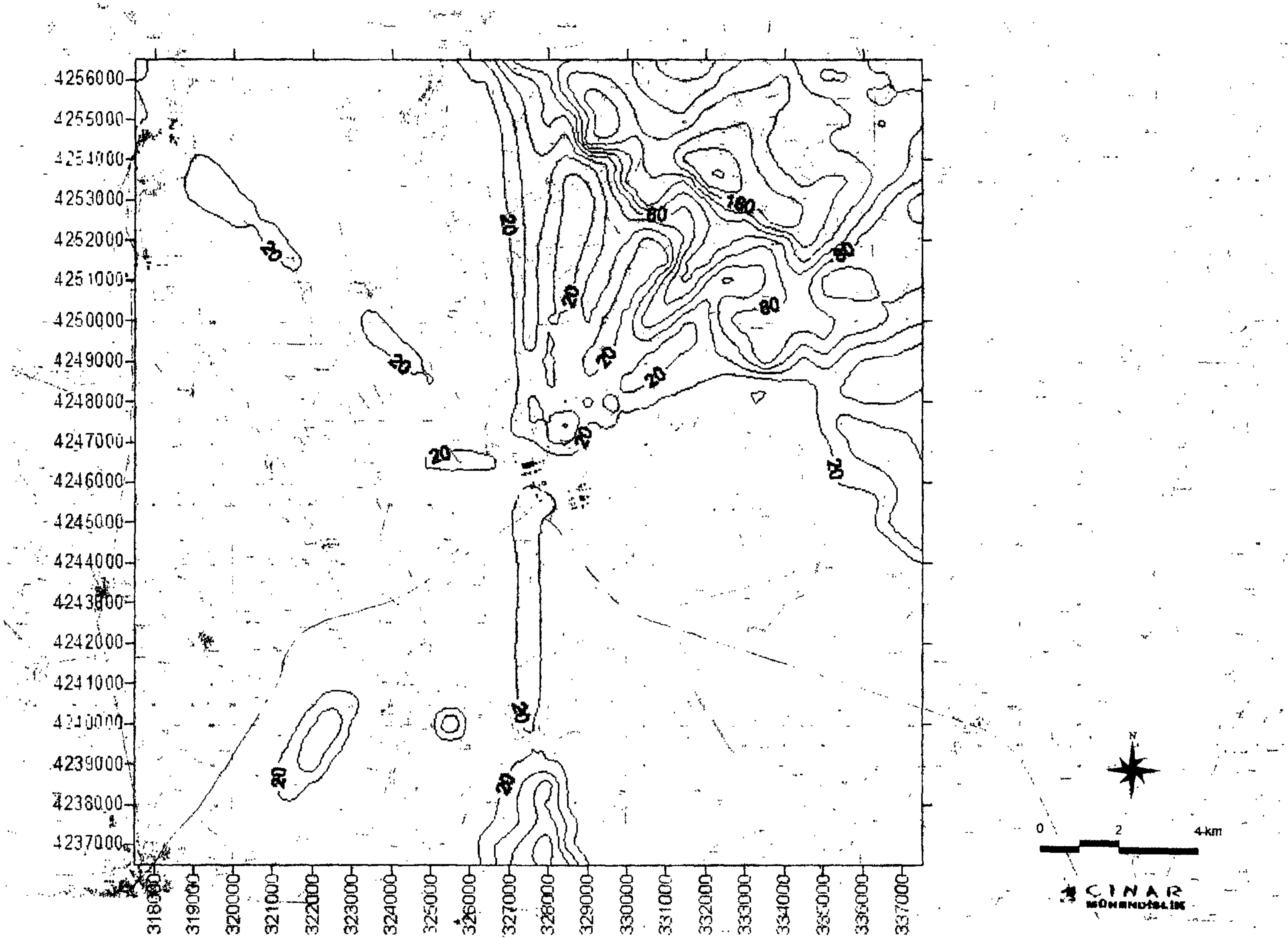
- Türk Çevre Mevzuatı (Cilt-1),TÇV,1999, Ankara
- Türk Çevre Mevzuatı (Cilt-2),TÇV,1999, Ankara.
- Pollution Prevention and Abatement Handbook, The World Bank Group,1998
- www.kahramanmaras.gov.tr
- www.kmtso.org.tr
- www.die.gov.tr
- Kahramanmaraş Çevre Durum Raporu, Kahramanmaraş İl Çevre Müdürlüğü, 1993 Kahramanmaraş.
- DMİ, "Afşin Meteoroloji İstasyonuna ait 1975-2004 Yılları Uzun Dönemli Meteoroloji Bülteni, 2004
- Afşin-Elbistan A Termik Santralı İşletme Müdürlüğü
- Afşin-Elbistan-A Termik Santralı Ünitelerinin Emniyetli ve Verimli Çalıştırılmasını Teminen İhtiyaç Duyulan Bakım, Modifikasyon ve Rehabilitasyonları Tespit Komisyonu Raporu, Afşin-Elbistan A Termik Santralı İşletme Müdürlüğü, 04-08 Ağustos, 2003.
- Turkey Assessment of Afşin-Elbistan Rehabilitation Final Report, Chubu Electric Power Co. Inc., August 10, 2004.
- www.dsi.gov.tr
- Kahramanmaraş İli Arazi Varlığı, KHGM
- Kahramanmaraş Afşin-Elbistan Termik Santrali Raporu, KSDB, Sağlık Bakanlığı, Ankara,2002
- Afşin-Elbistan (A) Termik Santralı Çevre Havasında SO_2 Ölçümleri Final Raporu, TUBİTAK-MAM, 2003.
- Firikçi, A., 2002, Afşin İlçesi Yerleşmelerinin Kuruluşu ve Gelişmesi, Key Matbaacılık, Ankara.
- AEATS İşletme Müdürlüğü Brifing Raporu 2004
- TEAŞ Türkiye Elektrik Üretim-İletim A.Ş. Genel Müdürlüğü, Afşin Elbistan A Termik Santrali Emisyon Raporu, Marmara Araştırma Merkezi Enerji Sistemleri ve Çevre Araştırma Enstitüsü, Ağustos 2000
- Mishra, P.C., Naik, A., Environmental management in Coal Mining amd Thermal Power Plants
- Afşin-Elbistan A-B Santralları Mırmırın Tepe Kireç Taşı Sahası ÇED Raporu, EÜAŞ, 2003
- Tokyay, M., Erdoğdu, K., 1998, Türkiye Termik Santralarından Elde Edilen Uçucu Küllerin Karakterizasyonu, Türkiye Çimento Müstahsilleri Birliği Yayını, Ankara.
- Oğuz,O. Discharge of Power Plant Stack Gases Through Cooling Towers: A Case Study for Afşin-Elbistan Series, September 1999
- Karaca, A., Afşin-Elbistan Termik Santrali Emisyonlarının Çevre Topraklarının Fiziksel, Kimyasal ve Biyolojik Özellikleri Üzerine Etkileri, 1997, A.Ü. Fen Bilimleri Enstitüsü, Doktora Tezi.
- Technical Report of the Site Investigation and Flue gas Desulphurization Retrofit Assessment, STEAG encotec GmbH, January 2003.
- www.worldbank.org
- www.euas.gov.tr
- Kahramanmaraş Afşin-Elbistan Termik Santrali Raporu, KSDB, Sağlık Bakanlığı, Ankara,2002
- 1994-1995 Çalışma Yıllığı,Sağlık Bakanlığı1997, Ankara.
- Su Akım Aylık Ortalama (1935-1995),EİE,2000,Ankara.

- Cenedese, G. Cosemans, J.J. Erbrink (chairman), R. Stubi. Vertical profiles of wind, temperature and turbulence. Report of Working Group 3 of COST Action 710, Preprocessing of Meteorological Data for Dispersion Modelling, oktober 1997.
- Stull, R.B., 1988. Introduction to boundary layer meteorology. Kluwer Academic Publishers, Dordrecht, The Netherlands.
- Driedonks, A.G.M., 1982. Models and observations of the growth of the atmospheric boundary layer. In: *Boundary Layer Meteorology*, vol. 23, pp. 283-306.
- Erbrink, J.J., 1994. Use of Advanced Meteorology in the Gaussian model "STACKS". *Boundary Layer Meteorology*, vol 74, pp 211-235.
- ERBRINK, J.J., 1994. The Advanced Gaussian model STACKS. In: Proceedings of the ERCOFTAC workshop on 'Intercomparison of advanced practical short-range atmospheric dispersion models', (Ed. J.C. Cuvelier), Manno, Switzerland, 29 August-3 September 1993.
- Pasquill, F., 1961. The estimation of the dispersion of windborne material. *Meteor. Mag.*, 90, pp 33-49.
- Pasquill, F., 1976. Atmospheric dispersion parameters in gaussian plume modelling, Part II. Possible requirements for change in the Turner Workbook values. *No. EPA-600/4-76-030b, US*
- Van Ulden, A.P. en Holtslag, A.A.M., 1985. Estimation of atmospheric
- boundary layer parameters for diffusion applications. *J. Climate and Appl. Meteor.*, 24, pp 1196-1207.
- Özbek, T., Güçlüer, S., Maraş Elbistan Çöllolar-B Linyit Sektörü 1977 yılı Faaliyet Raporu, MTA
- Aydın V., Karlı R., Kahramanmaraş-Afşin-Elbistan Neojen havzası Linyit Aramaları Resistivite Etüdü, 1982, MTA
- Afşin-Elbistan A-B Termik Santralları Mırmırın Tepe Kireç Taşı Sahası ÇED Raporu, EÜAŞ, 2003
- 2004-2005 Av Dönemi Merkez Av Komisyonu Kararı. Orman Bakanlığı Milli Parklar ve Av-Yaban Hayatı Genel Müdürlüğü.
- Türkiye'de Yaşayan Kuşlar, 2000, Milli Parklar ve Av-Yaban Hayatı Genel Müdürlüğü, No: 001, Ankara.
- Kiziroğlu, İ., 1993, The Birds of Türkiye (Species List İn Red Data Book), TTKD, Ankara.
- Demirsoy, A., 1997, Omurgalılar (Amniyota), Cilt III-Kısım II, Meteksan A.Ş., Ankara.
- Demirsoy, A., 1998, Omurgalılar (Anamniyota), Cilt III-Kısım I, Meteksan A.Ş., Ankara.
- Demirsoy, A., 1999, Genel ve Türkiye Zoocoğrafyası, Meteksan A.Ş., Ankara.
- Demirsoy, A., 1996, Amfibiler. Çevre Bakanlığı, Çevre Koruma Genel Müdürlüğü, Ankara.
- Demirsoy, A., 1996, Sürüngenler. Çevre Bakanlığı, Çevre Koruma Genel Müdürlüğü, Ankara.
- Demirsoy, A., 1996, Memeliler. Çevre Bakanlığı, Çevre Koruma Genel Müdürlüğü, Ankara.
- Yaltırık, F., Efe, A., 1989, Otsu Bitkiler Sistematiği, İstanbul Üniversitesi, Fen Bilimleri Enstitüsü Yayınları, No:3, İstanbul.
- DAVIS, P.H., Flora of Turkey and the East Aegean Islands, Vol. 1-9, Edinburgh, 1965-1985.
- DAVIS, P.H., MILL, R.R., KIT, T., Flora of Turkey and the East Aegean Islands, (Suppl.) Vol. 10, Edinburgh, 1988.
- Anşin, R., 1988, Tohumlu Bitkiler, Karadeniz Teknik Üniversitesi, Orman Fakültesi Yayınları, No: 15, Trabzon.

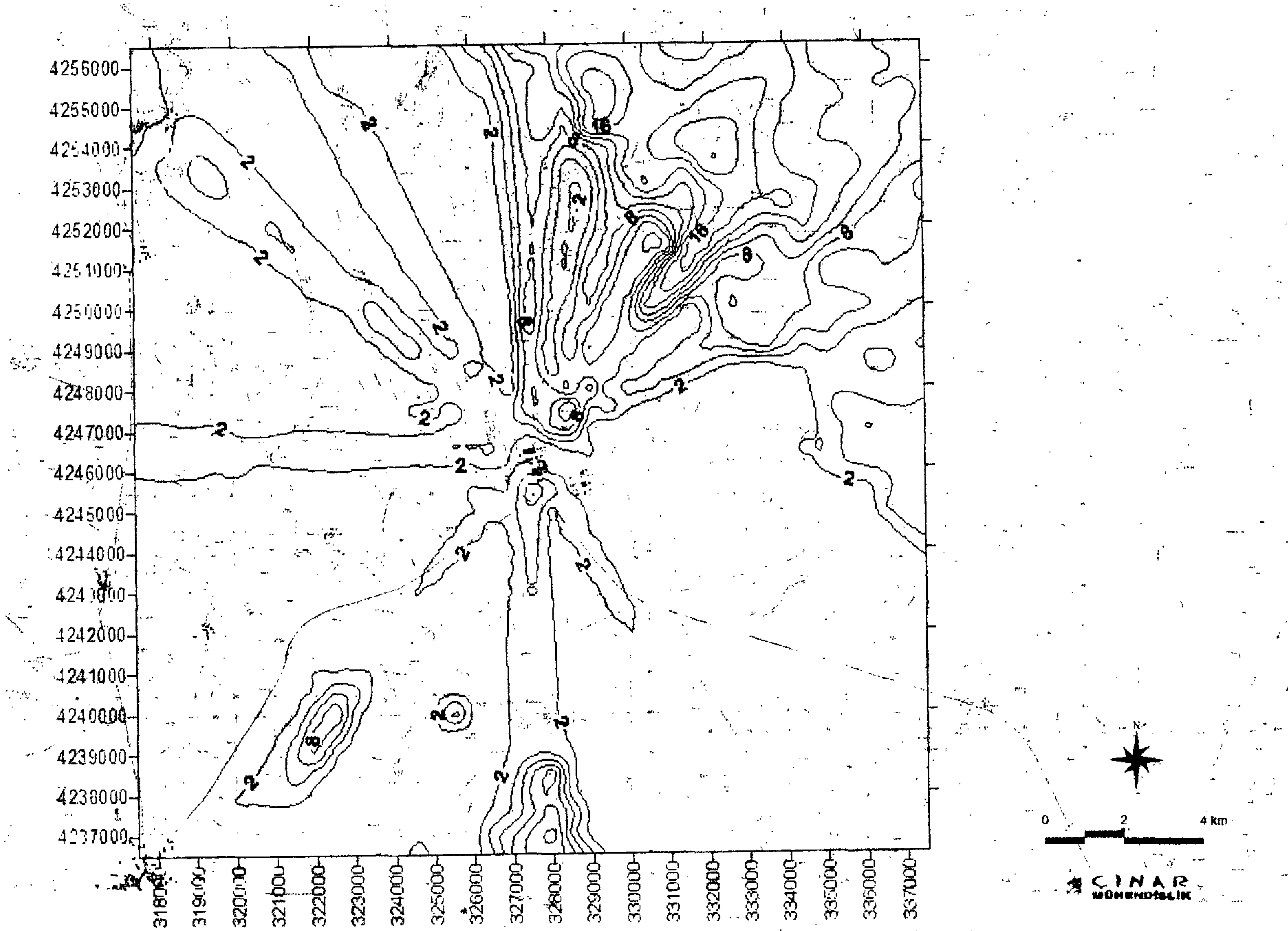
- Ekim T., Koyuncu, M., Vural, M., Duman, H., Aytaç, Z., Adıgüzel, N., 2000, Türkiye Bitkileri Kırmızı Kitabı, Türkiye Tabiatını Koruma Derneği, Ankara.
- Baytop T., 1994, Türkçe Bitki Adları Sözlüğü, TDK, Ankara.
- Bitki ve Toprağın Kimyasal Analizleri III: Toprak Analizleri, Ankara Üniversitesi Ziraat Fak. Eğitim, Araştırma ve Geliştirme Vakfı Yayınları No: 3, Prof.Dr. Burhan Kacar
- www.mta.gov.tr
- www.tupras.com.tr

PERSONNEL LIST IN COMPLIANCE WITH EIA COMPETENCE LICENSE COMMUNIQUE

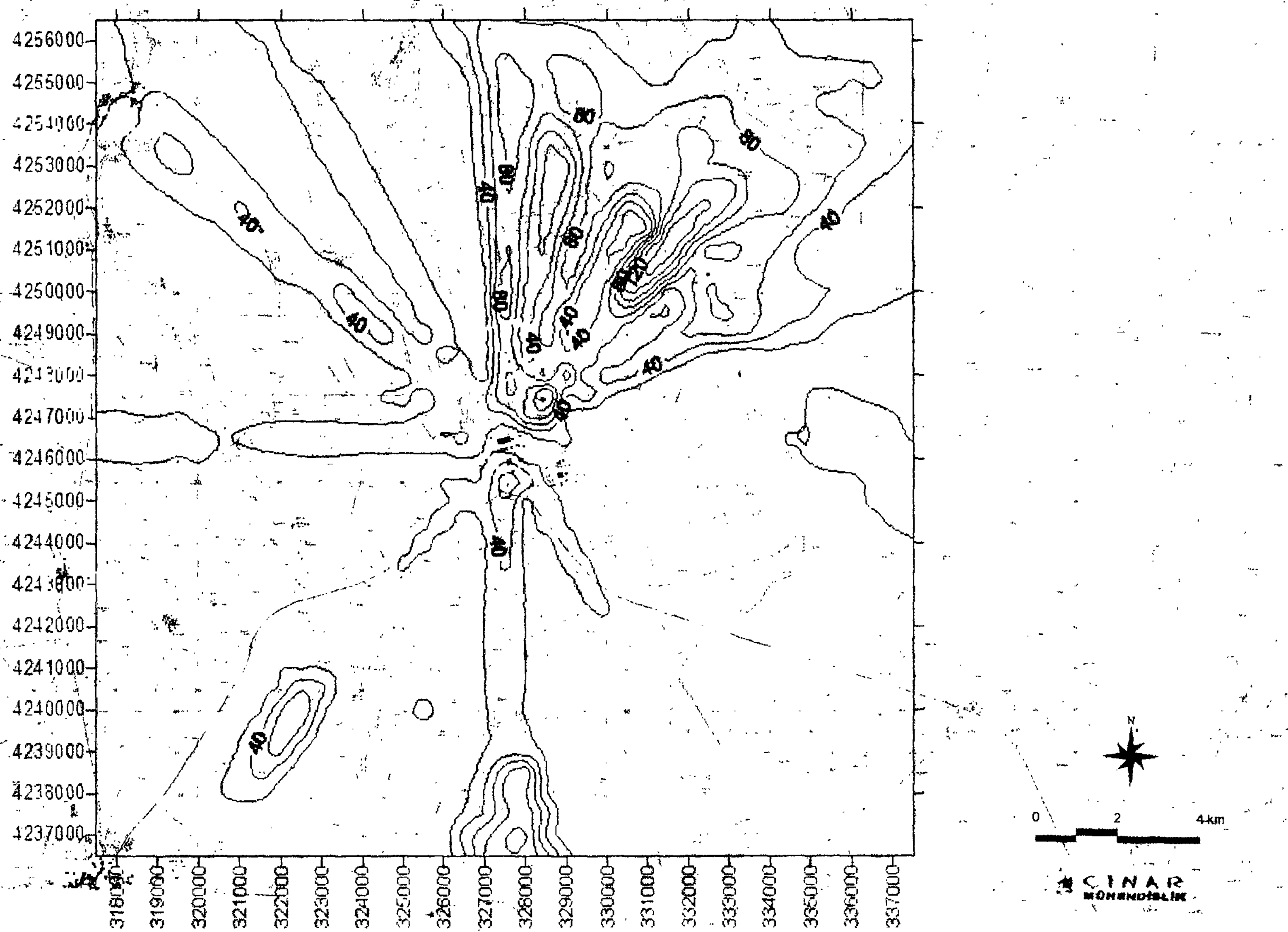
Name, Surname	Position /Occupation	Signature
Banu Göle ÖZSOY	Project Coordinator Environmental Engineer, M.Sc.	
Özlem NADASTEPE	Assistant Project Coordinator Environmental Engineer, M.Sc.	
Jan Henk BLOEMBERGEN	EIA and Process Expert Chemical Engineer, M.Sc.	
Selahittin HACIK[illegible]OĞLU	Agriculture and So[illegible] Expert Agricultural Engineer, M.Sc.	
Johannes Jan (Hans) [illegible]	Air Quality Expert Chemical Engineer	
Fatma DİNÇ	Ecologist Biologist, M.Sc.	
Sümer ÜNAL	Thermal Power Plant Expert Electrical Engineer, M.Sc.	
Jan MIDDELKAMP	Flue Gas Desulphurization (FGD) Specialist Chemical Engineer, M.Sc.	
Serkan MURATLI	GIS Expert & Geological Engineer Geological Engineer, M.Sc.	
Afşin GÖZEN	Quality Control/ Quality Assurance Expert	
Muhsin DERVİŞOĞULLARI	Air, Noise and Water Quality Expert (Baseline Studies) Environmental Engineer	



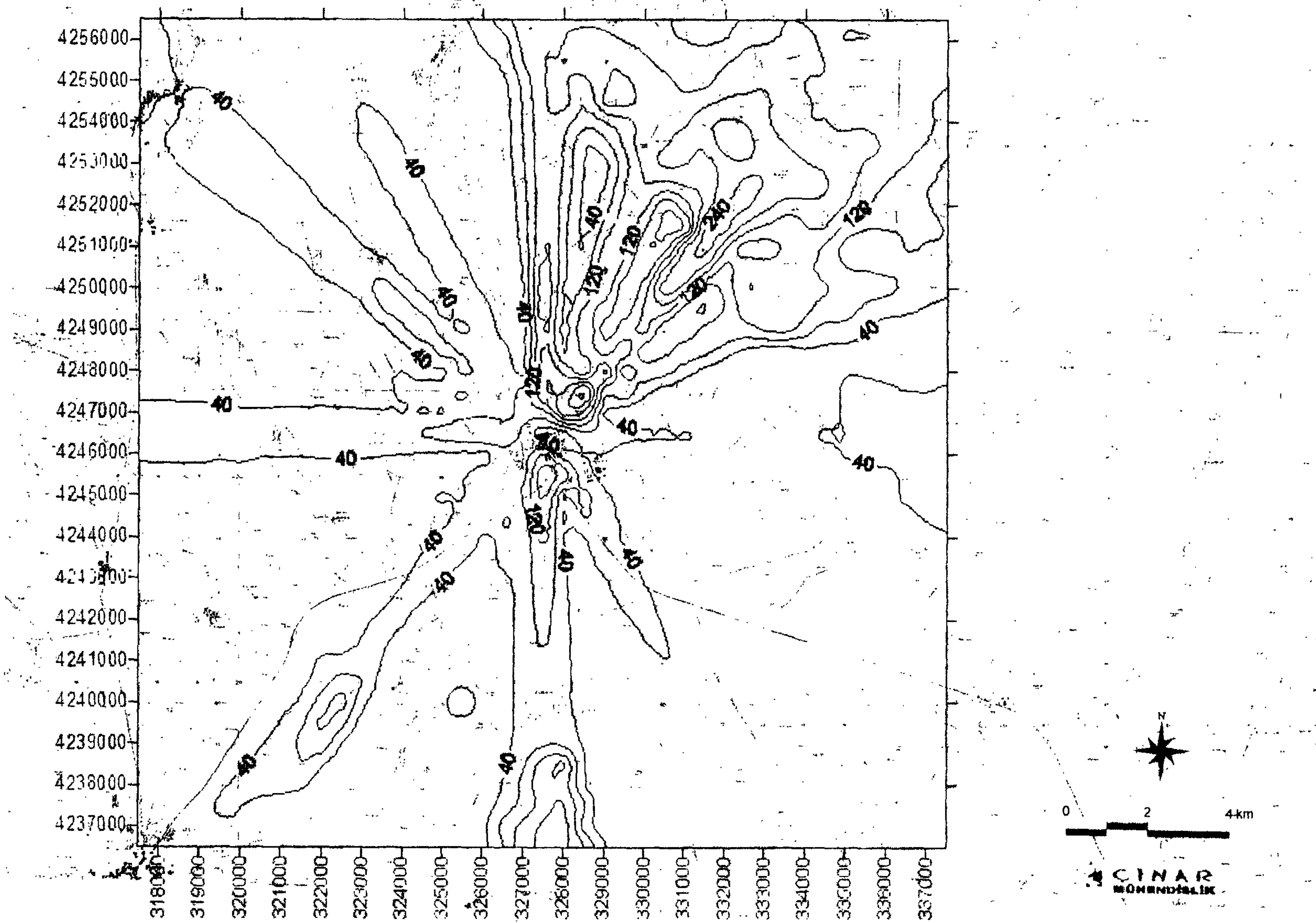
Annual Dispersion of SO2 for Existing Situation µg / m³



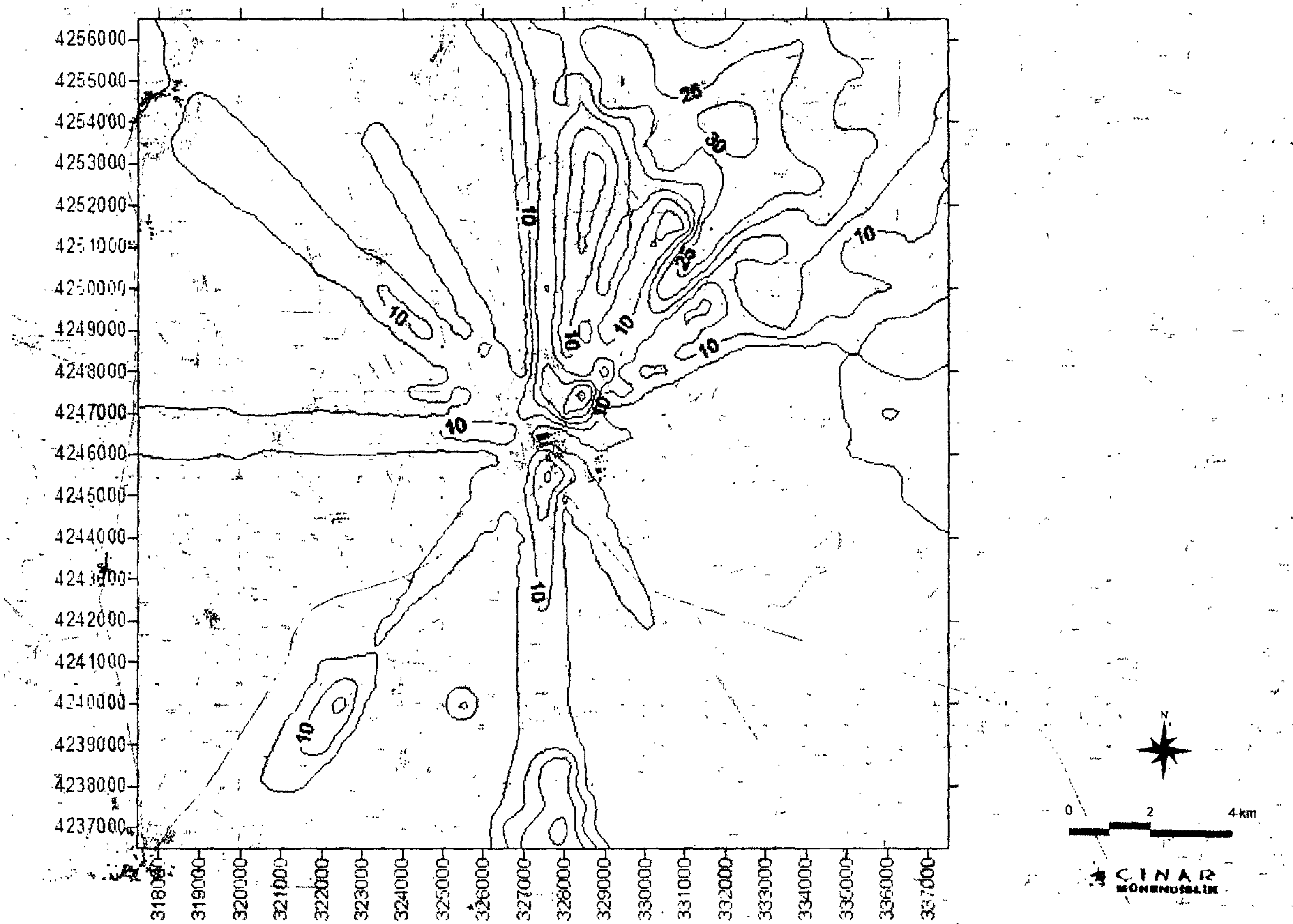
Annual Dispersion of NOx for Existing Situation µg / m³



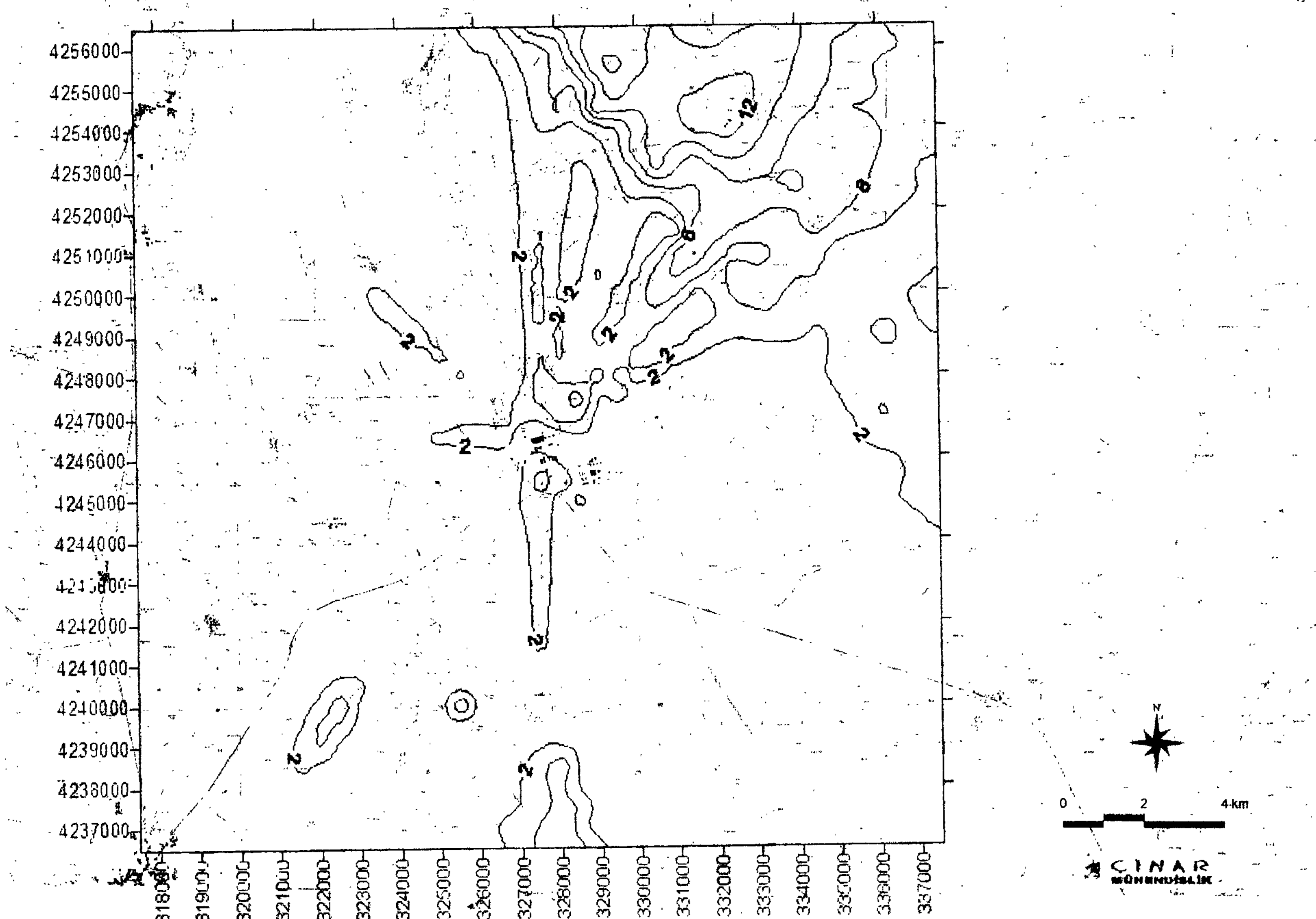
Annual Dispersion of PM10 for Existing Situation µg / m³



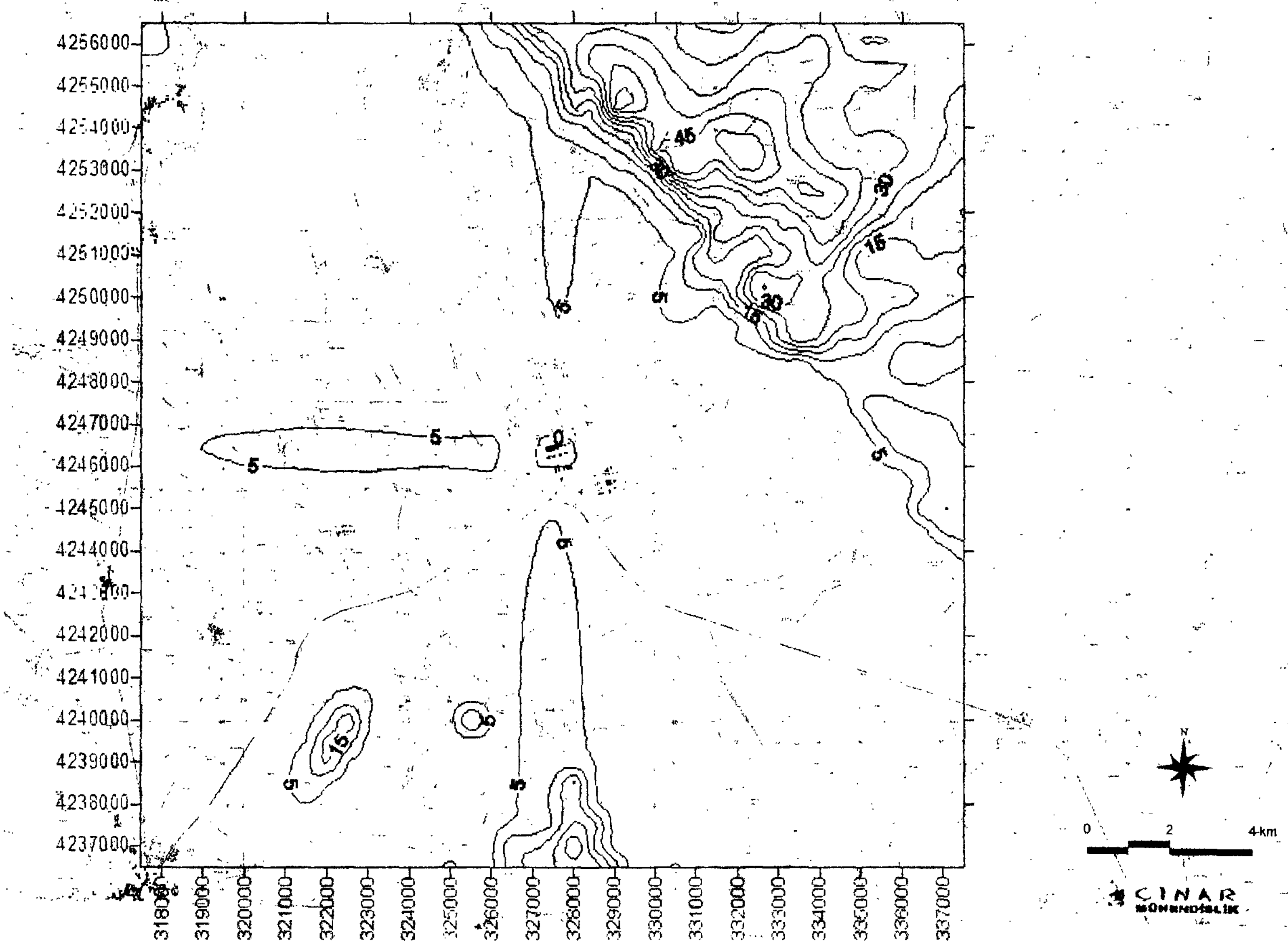
Annual Dispersion of SO2 for Base Scenario µg / m³



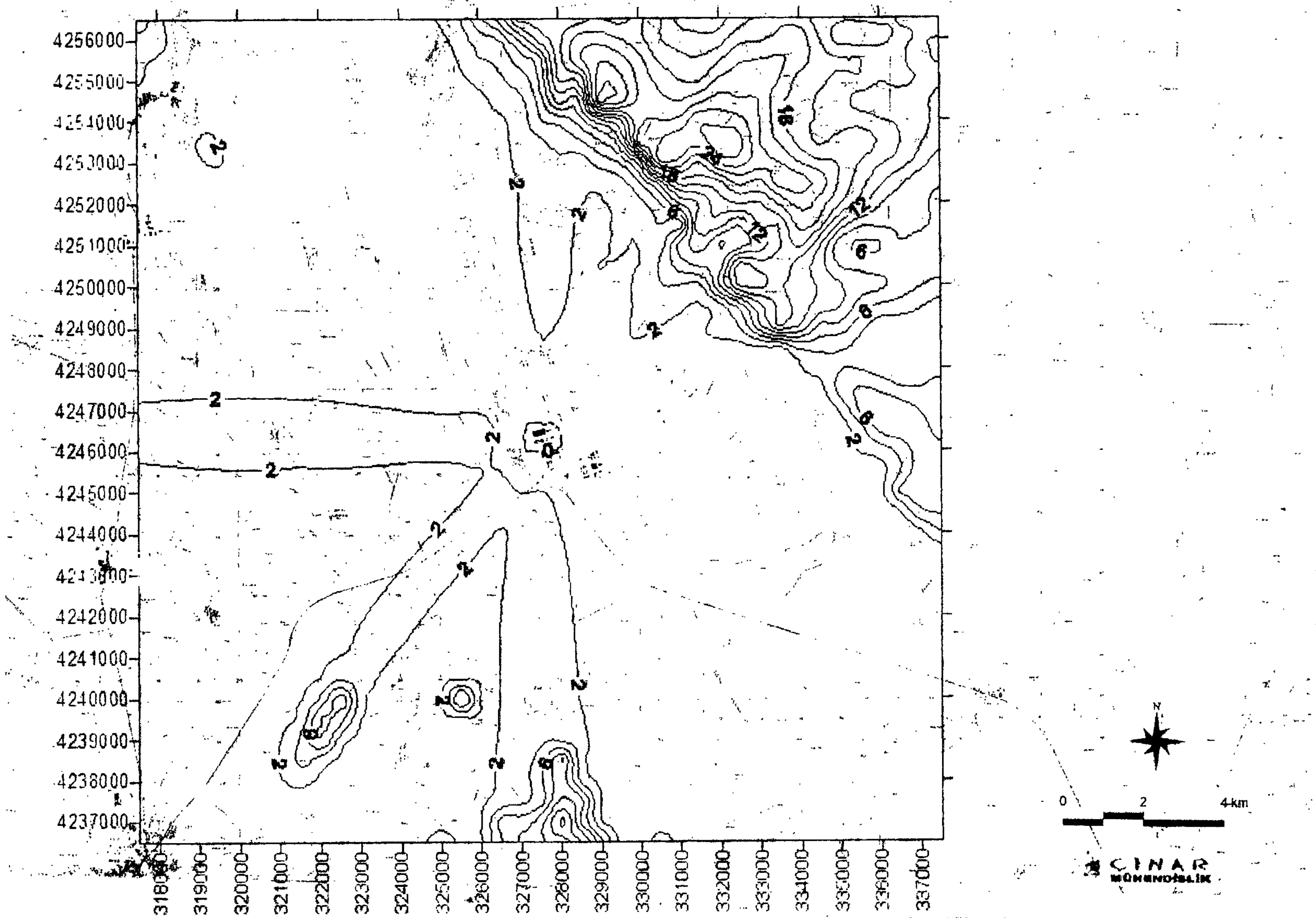
Annual Dispersion of NOx for Base Scenario μg / m³



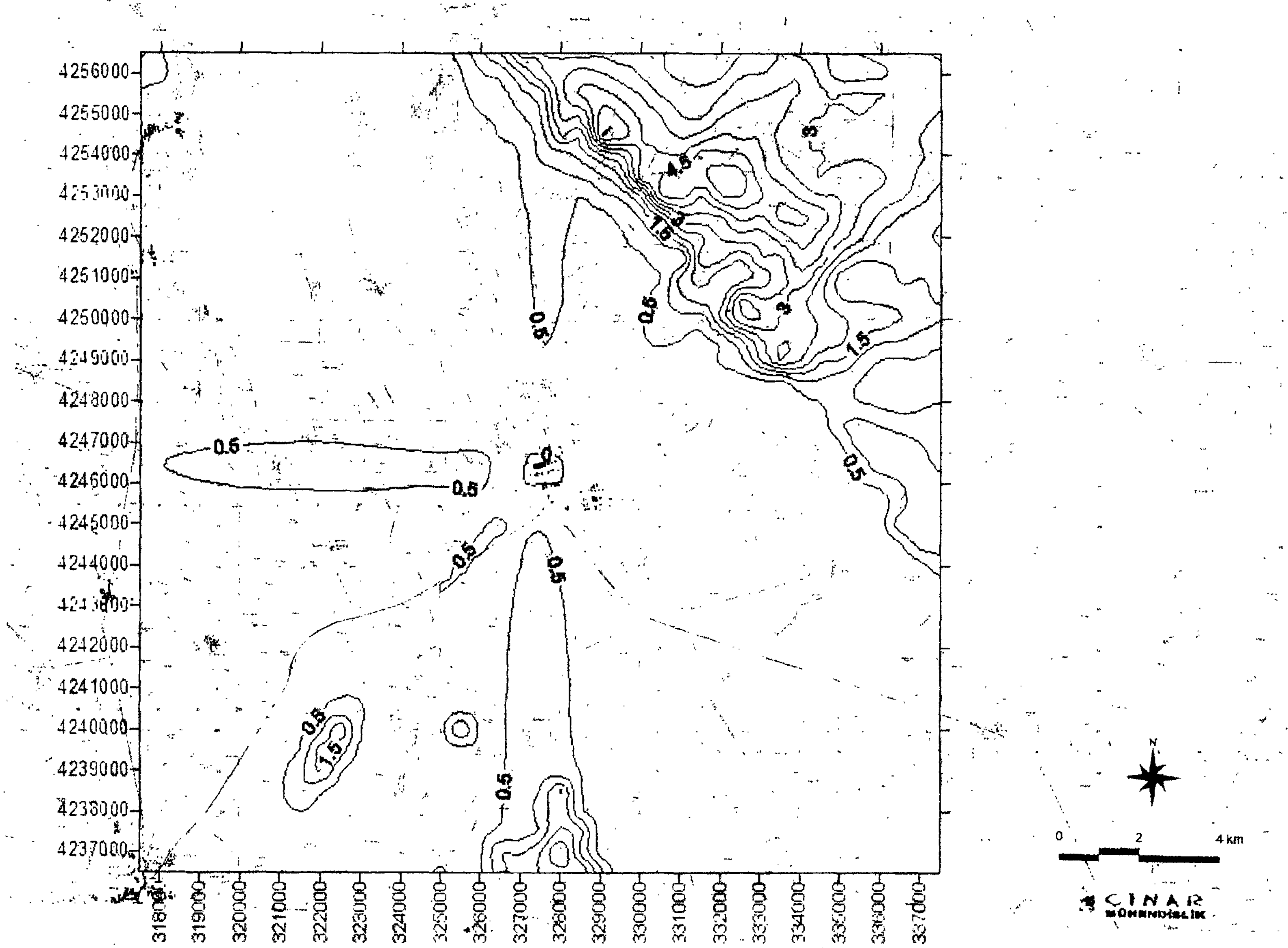
Annual Dispersion of PM10 for Base Scenario µg / m³



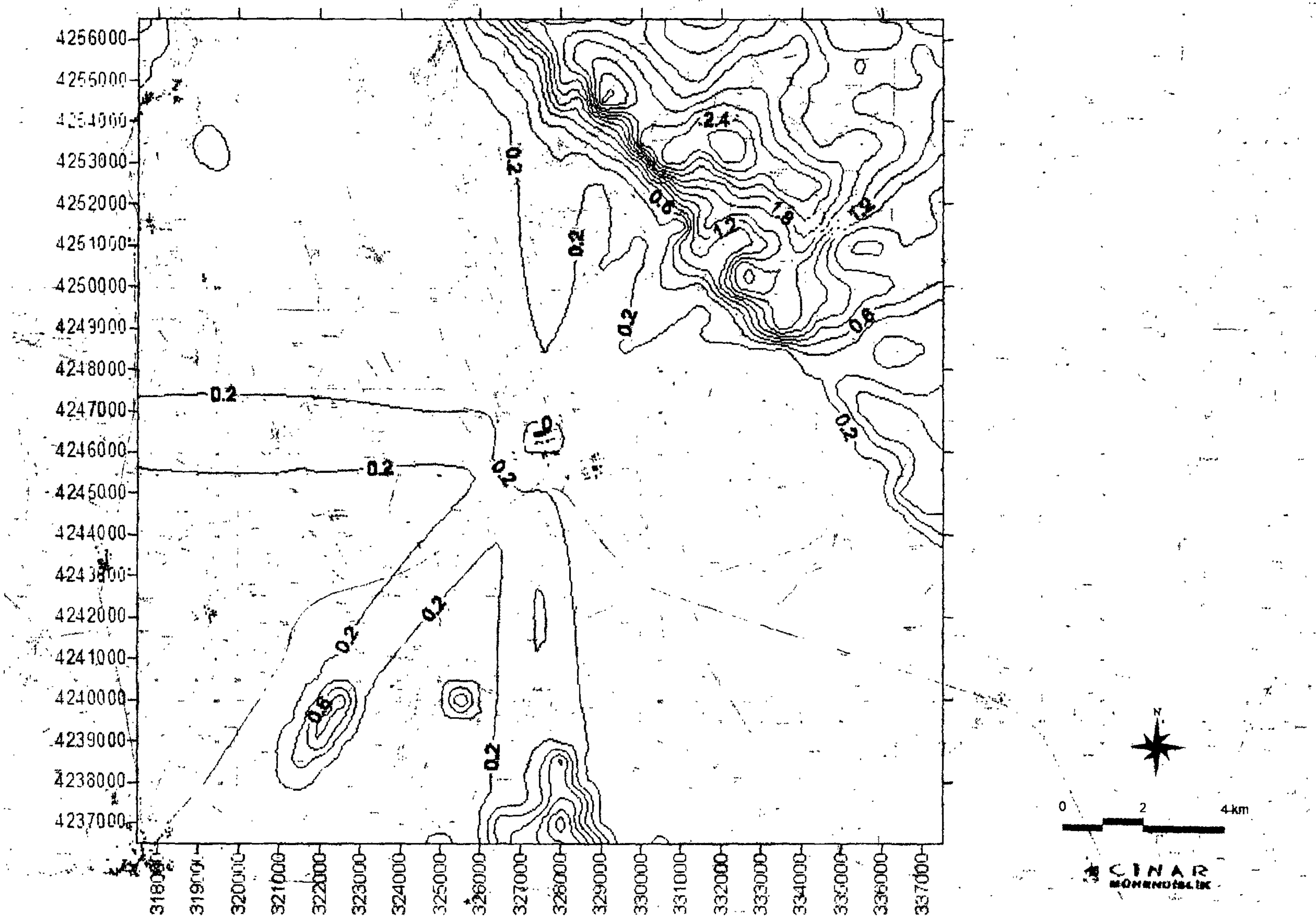
Annual Dispersion of SO2 for Alternative-1 with FGD µg / m³



Annual Dispersion of NOx for Alternative-1 with FGD µg / m³



Annual Dispersion of PM10 for Alternative-1 with FGD µg / m³



Annual Dispersion of PM10 for Alternative-2 with FGD µg / m³