ETİ BAKIR A.Ş.

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT

PREPARED BY

EN-ÇEV
Enerji Çevre Yatırımları ve Danışmanlığı Ltd. Şti.
Mahatma Gandi Caddesi No : 92/ 2-3-4-6-7 06680 G.O.P. ANKARA
Tel : +90 312 447 26 22 Fax : +90 312 446 30 10 encev@encev.com.tr

EN-ÇEV ENERGY ENVIRONMENTAL INVESTMENTS CONSULTANCY INC.

ISO 9001 TQCSI JAS-ANZ Licence No: TK1978-QC

OHSAS Safety (OH&S) System TQCSI Ohsas Certified Licence No: TR1978-SC

ISO 14001 TQCSI JAS-ANZ Licence No: TR1978-EC

CONTENTS

TABLE LIST

FIGURE LIST

ANNEX LIST

ABBREVIATIONS

AERMOD	Atmospheric Dispersion Modelling
BAT	Best Available Techniques
ÇGDYY	Regulation on Assessment and Management of Environmental Noise
DAP	Dia Ammonium Phosphate
DSİ	State Hydraulic Works
EFMA	European Fertilizer Manufacturers Association
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EP	Equator Principles
ESIA	Environmental and Social Impact Assessment
GHGs	Green House Gases
IFC	International Finance Corporation
MTA	Mineral Research and Exploration
NP	Composed Fertilizer
PM	Particulate Matter
PR	Performance Requirements
PS	Performance Standards
RCIOAP	Regulation on the Control of Industrial Origin Air Pollution
RCWP	Regulation on the Control of Water Pollution
TSE	Turkish Standards Institution
TSS	Total Suspended Solid

1. EXECUTIVE SUMMARY

Phosphate Concentrator Facility and Mine Sites that are located in Mardin and have been inactived since 1994 were transferred to ETİ BAKIR A.Ş. in 2011.

ETİ BAKIR A.Ş. has planned to establish a fertilizer plant as integrated to existing Concentrator Facility with taking into account Turkey's increaing fertilizer needs. In the plant, DAP and composed fertilzer will be produced. Therefore, the dependence on foreign countries will decrease on fertilier.

The aim of this study, determining environmental and social impacts of Phosphate Mine Sites, Concentrator Facility and Integrated Fertilizer Plant, contain mitigation measures to determined impacts. Hence, environmental and social risks/impacts will be become known, inadequacies will be determined and parties will be informed.

The following issues were used as base during determining impacts/risks.

- The categorization of Project as considering magnitude of impacts.
- Description of Project in terms of Project feature.
- Determining of Project area and impact area with maps and drawings.
- Determinig of main impacts/risks
- Evaluating of Project according to national and international legislation
- Settling of mitigation measures to impacts/risks
- Public infomation about project

This report was prepared according to above issues. The possible impacts are given below.

Emissions

The emission that can be occured in all phase of the Project is dust. In addition to this in the operation phase, stack gas emission will be come off. For dust emission, irrigation Works, covered systems will be conducted. Stack gas emission will be under the limit values of IFC EHS Guidelins with dry and wet gas cleaning systems and electrostatic filters.

Waste

The main waste are solid waste based on personnel an process. Domestic type solid waste will be sent to an area designated by Mazıdağı Municipality by means of straight trucks without polluting the environment. The waste that are likely to be considered as recyclable and required to be disposal will be delivered to licensed firm. The waste that occurred after production such as leach cake etc. will be assessed as sale good firstly. If it is not possible, the waste will be stored in the project area.

Water Usage and Waste Water

In tha facilities water will be used for personnel, irrigation works and processes. The water will not be used excessively. The process water wil be reused in the system after treatment. Te domestic type waste water will be reused for irrigation of roads in the Project area after treatment.

Noise

The largest noise source is blasting activities on mine sites. However, the calculation shows that the impacts of noise will be very little on the closest residental.

2. NATIONAL AND INTERNATIONAL

2.1.Legislation

2.1.1.National EIA Regulation

The national EIA Regulation was published in Official Gazette issue no 28784 of 3rd October 2013.

Assessment of the Project according to EIA Regulation;

Phosphate Mine Sites was assessed on the strength of Provisional Article 3. The article mentions about *"the Project that began to operate before 07.02.1993 are out of the scope of Environmental Impact Assessment"*. The letter shows the Mine Sites are out of the scope of EIA is given in **Annex-1**.

Phosphate Concentrator Facility; was assessed on the strength of Provisional Article 3. The letter shows the Concentrator Facility is out of the scope of EIA is given in **Annex-2**.

Integrated Fertilizer Facility; was assessed on the strength of *"Annex-1: The Projects that EIA is applied, Article 3: Chemical Facilites, Clause b) Inorganic Chemcals Manufacturing, Clause c)Phosphorus, Nitrogenous and Potassium based Chemical Fertilizer Manufacturing that have annual capacity as 20.000 tonand over."*Accordingly, an EIA was prepared and the report had "EIA is Positive" document. The document is given in **Annex-3**'te verilmektedir.

2.1.2. International Instruments and Documents

2.2.1.1. Equador Principles (EP) III

The Equator Principles comprise voluntary loan risk management and guidance principles for assessment of environmental and societal risks in project finance activities. Having adopted these principles, the finance industry has set forth certain environmental and societal criteria for management of these risks in any development projects which are funded on a global scale.[1]

The Equator Principles have been developed for the purpose of ensuring analysis under a consistent approach of any integral aspects fully covering investment under major international projects carried out in different countries.

The principles, which are presently recognized as a "golden standard" in sustainable project finance and management, are quoted below.[2]

Principle 1: Review and Categorization

[1]http://www.sgs.com.tr/tr-TR/Finance/Lenders-Adviser/Due-Diligence/Environmental-and-Social-Due-Diligence/Equator-Principles-Independent-Review.aspx
[2] http://www.csb.gov.tr/db/ced/editordosya/CED_KITAP.pdf

Projects are divided into three categories according to their environmental and societal risks -- A (having potential significant adverse effects), B (having potential limited adverse effects) and C (Having minimal or no adverse effects). The criteria which have been developed by the International Finance Corporation, IFC), a private sector affiliate of the World Bank, apply for categorization.

Principle 2: Environmental and Social Assessment

For all Category A and Category B Projects, the EPFI will require the client to conduct an Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and impacts of the proposed Project. The Assessment Documentation should propose measures to minimize, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the proposed Project.

Principle 3: Applicable Environmental and Social Standards

Assessment should be based on IFC Performance Standards as well as on the World Bank Group's Industry Specific Health and Safety Ordinance. Assessment process must also consider relevant national legislation.

Principle 4: Environmental and Social Management System and Equator Principles Action Plan

Borrower prepares an action plan for the findings in the assessment for any projects in Categories A and B. Action Plan defines necessary activities in order to implement measures for mitigation of effects and risks defined in assessment, works for improvement and necessary monitoring measures to manage works for improvement and effects and risks.

Principle 5: Stakeholder Engagement

For risky projects, government, borrower or third party expert informs the communities affected by the project, obtaining their comments in connection therewith.

Principle 6: Grievance Mechanism

Borrower establishes a grievance mechanism as a part of its management system.

Principle 7: Independent Review

For all Category A and, as appropriate, Category B Projects, an Independent Environmental and Social Consultant, not directly associated with the client, will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence, and assess Equator Principles compliance.

Principle 8: Covenants

For the projects in Categories A and B, borrower pledges to comply with relevant legislation and action plan developed and provide periodical reports.

Principle 9: Independent Monitoring and Reporting

To assess Project compliance with the Equator Principles and ensure ongoing monitoring and reporting after Financial Close and over the life of the loan, the EPFI will, for all Category A and, as appropriate, Category B Projects, require the appointment of an Independent Environmental and Social Consultant, or require that the client retain qualified and experienced external experts to verify its monitoring information which would be shared with the EPFI.

Principle 10: Reporting and Transparency

Each finance institution agreeing to EP pledges to make minimum one official announcement on EP implementation and experiences thereof by considering necessary rules of confidentiality.[3]

2.2.1.2. European Bank for Reconstruction and Development requirements

The Performance Requirements (PR's) which are set out by the European Bank for Reconstruction and Development are listed below.

PR 1: Environmental and Social Appraisal and Management

This requirement has been developed for objectives such as identification of project origin positive and negative social and environmental effects and introduction of measures for the sake of avoiding negative effects or if unavoidable, for mitigation of effects. What must be done accordingly are a couple of studies such as Environmental and Social Assessment, Environmental and Social Action Plan, Organization Capacity and Commitments and Monitoring and Review.

PR 2: Labor and Working Conditions

The objectives of this requirement include items such as establishment and maintenance of a relationship between employees and management, development of equal opportunities among employees, ensuring fair conduct and ensuring working conditions meeting national labor and worker legislations. What must be done in connection therewith include a couple of studies such as management of the relationship among the employees, development of human resources policies, introduction of necessary measures in connection with child labor, prevention of forced labor, ensuring equal opportunities among the workers through prevention of discrimination and putting into implementation necessary practices for Labor Health and Safety.

PR 3: Prevention and Abatement

[3] http://enerjienergy.com/artikel.php?artikel_id=253

This requirement has been developed by a couple of targets for elimination of the project's negative effects on human health and environment or if not possible, reduction of such effects, promotion of reduction of greenhouse gas emissions from the Project and incorporation of pollution prevention techniques into the project design stage. Issues such as pesticide use and management, preparedness for and response to emergencies and ambient conditions are also treated under this requirement.

PR 4: Community Health, Safety and Security

This requirement covers several issues such as infrastructure and equipment safety, use of hazardous substances, environmental and natural resources and preparedness for and response to emergencies.

PR 5: Land Acquisition, Involuntary Resettlement and Economic Displacement

It is the objective of this requirement to reduce and prevent, if possible, involuntary resettlement. For this purpose, an assessment must be made of different area alternatives in the project design process. The scope of this requirement covers establishment of a grievance mechanism, provision of information to the stakeholders in any processes, development and implementation of resettlement plan and preparation of a resettlement plan in connection therewith.

PR 6: Biodiversity Conservation and Sustainable Natural Resource Management

The obligations under this requirement cover the issues of assessment of effects, habitat preservation (natural habitat, critical habitat and modified habitat), protected areas and use and sustainable management of natural resources.

PR 7: Indigenous Peoples

Issues such as identification and assessment of indigenous peoples, avoidance of adverse effects on such peoples, preparation of plan for development of indigenous peoples, informing the stakeholders and including them in the process, prevention of ethnicity based discrimination and establishment of grievance mechanism are treated under this requirement.

PR 8: Cultural Heritage

Issues such as monitoring effects and risks on cultural heritage, preservation of cultural heritage, avoidance of adverse effects and assessment and management of unavoidable effects are treated under this requirement.

PR 9: Financial Intermediaries

Issues such as Environmental And Social Condition Assessments, stakeholder engagement and reporting to the European Bank for Reconstruction and Development are part of this requirement.

PR 10: Information Disclosure and Stakeholder Engagement

This requirement covers keeping the stakeholders informed of any project processes. Issues such as regular performance of information exchange starting from the project preparation and extending to any ongoing processes in connection therewith and establishment of grievance mechanism are treated under this requirement.

2.2.1.3. International Finance Corporation Performance Standards

The Performance Standards (PS's) required to be observed by the parties intending to make use of IFC finance sources are listed below.

PS 1: Assessment and Management of Environmental and Social Risks and Impacts

This standard has been developed for objectives such as identification and assessment of Project environmental and social risks and effects, projection and prevention of risks and effects on the communities and environment affected by the project or minimization of such effects where prevention is not feasible. An environmental and social system must be developed at the stage of implementation of this standard. This system comprises identification of policies, risks and effects, management programs, organizational capacity and competence, preparedness for and response to emergencies, stakeholder engagement and monitoring and assessment.

PS 2: Labor and Working Conditions

The objectives of this standard are to treat employees fairly, promote non-discrimination and equal opportunity, maintain the relationship between employees and management and ensure its improvement, ensure compliance with national employment and labor laws, protect any employees such as vulnerable groups like migrant workers and any other employees like employees in the supply chain, preserve safe and healthy working conditions and labor health and prevent forced labor.

PS 3: Resource Efficiency and Pollution Prevention

Implementation of this standard requires prevention or minimization of adverse effects on human health and environment by preventing or reducing pollution arising from the Project activities. In addition, the objectives of the standard also include extension of use of resources including energy and water resources in a more sustainable manner and reduction of Project related greenhouse gas emissions.

PS 4: Community Health, Safety and Security

The party which is obligated to observe this standard will assess the risks and effects on the health and safety of the communities affected throughout the Project, identifying prevention and control measures meeting international industry practices such as the World Bank Group's Environmental and Health Guidelines (EHS Guidelines). By determining risks and effects, it

will recommend alleviation measures in proportion to their characteristics and dimensions. Such measures will aim at preventing risks and effects rather than reducing them.

PS 5: Land Acquisition and Involuntary Resettlement

The objectives of this standard include prevention of displacement of people or where this is not feasible, minimization of such displacement and avoidance of involuntary resettlement of people by making an assessment of the alternative project sites. The parties which are obligated to comply with the standard must also include properly informing the people of the process in case of resettlement, conducting land acquisition through consultation with them and improvement of livelihoods and living standards of displaced persons.

PS 6: Biodiversity Conservation and Sustainable Management Living Natural Resources

This standard has been developed for the purpose of preserving and maintaining biodiversity, use of the eco-system and extending sustainable management of living natural resources.

PS 7: Indigenous Peoples

This standard includes obligations such as ensuring full respect to the human rights, dignity and targets of indigenous peoples in the project area and its immediate environs as well as their cultures and livelihoods based on natural resources, projection and elimination of adverse effects of the projects on the communities of indigenous peoples or where it is not possible to eliminate them, their minimization and establishment and maintenance of relations with indigenous peoples affected by the project throughout the Project.

PS 8: Cultural Heritage

The objective of the standard developed is to protect cultural heritage from adverse effects arising from the Project activities and support maintenance of cultural heritage and extend sharing of the gains obtained from use of cultural heritage in an equal manner.

2.1.3.The Categorisation of Project

Category A: This group includes projects with major potential environmental and societal risks / effects. Such risks / effects are of many kinds, unavoidable and may not be eliminated by mitigation measures.

Category B: This group includes such projects with limited potential environmental and societal risks / effects. Such effects are limited quantitatively and likewise, they have limited areas of diffusion. These risks / effects may generally be eliminated thanks to the mitigation measures.

Category C: This group includes such projects having minimum or no environmental and societal risks / effects.

The planned project falls in **Category A** and existing facilities fall in **Category B.**

2.2. Legal and Regulatory Framework

The relevant laws that promote environmental management in Turkey have been adequately reviewed and applied by the EIA Team including the following:

- Regulation on the Control of Industrial Origin Air Pollution
- Regulation on Assessment and Management of Environmental Noise Pollution
- Water Pollution Control Regulation
- Solid Waste Control Regulation
- Environmental Impact Assessment Regulation
- Regulation on Control of Hazardous Wastes
- Regulation and Guidelines on Occupational Health and Safety
- Regulation on Preparation and Distribution of Hazardous Materials and Safety Information
- Regulation on Control of Waste Oils
- Regulation on the General Principles for Waste Management
- Regulation on the Permissions and Licenses Required to Be Obtained As Per the Environmental Law
- Groundwater Law
- Environment Law
- Regulation on Control of Excavation Soil, Construction and Debris Waste
- Related EU Directives
- Related International Conventions that Turkey is a party (as summarized below)

Bern Convention on Protection of Wildlife and Natural Habitats

This convention aims to protect the wild plant and animal species together with their natural living environments, putting special emphasis on the endangered species. Turkey has become a party to the Convention on 1984.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

CITES Convention has developed a system which set up a condition of government permission for the trading of endangered species of wild fauna and flora. Turkey has become a party to the Convention on 1996.

Ramsar Convention on Wetlands

The basic aim of the Convention is to emphasize the fact that ‘wetlands are important economic, cultural, scientific and social resources and their loss is irreversible’. Turkey has become a party to the Convention on 1994.

Biodiversity Convention (Rio Conference)

The Convention establishes three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources. Turkey has become a party to the Convention on 1997.

Convention Concerning the Protection of the World Cultural and Natural Heritage Paris

The convention considers adoption of new provisions in the form of a convention establishing an effective system of collective protection of the cultural and natural heritage of outstanding universal value, organized on a permanent basis and in accordance with modern scientific methods. Turkey has become a party to the Convention on 1983.

The Protocol for the Protection of the Mediterranean Sea against Pollution

The Convention aims to protect the Mediterranean Sea against all sorts of pollution by the Mediterranean countries. Turkey has become a party to the Convention on 1981.

Convention on Control of Transboundary Movements of Hazardous Wastes and their Disposal

The convention aims to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes. Turkey has become a party to the Convention on 1994.

Convention on Long-Range Transboundary Air Pollution

To create an essential framework for controlling and reducing the damage to human health and the environment caused by transboundary air pollution. Turkey has become a party to the Convention on 1994.

2.3.Institutions

In the EIA Process, institutions involved in and issued opinions/suggestions to the Project are listed below.

- Ministry of Environment and Urban Planning
    - General Directorate for Environmentel Management
        - Head of Department for Chemicals Management
        - Head of Department for Waste Management
- Governorship of Mardin
    - Provincial Directorate of Environment and Urban Planning
    - Provincial Directorate of Food, Agriculture and Livestock
    - General Secretary of Special Provincial Administration
- Ministry of Forestry and Water Affairs
    - General Directorate for State Hydraulic Works
    - Directorate of Nature Conversation and National Parks
- Mayorship of Mazıdağı

3.LOCATION OF PROJECT

3.1.Existing Facilities

3.1.1.Phosphate Mine Sites

There are a total of 7 licensed exploration phosphate sites as part of the facility. These sites are the sites having the license numbers, İR 6410, İR 20066822, İR 6411, İR 20066823, İR 16987, İR 20066824 and İR 33838. Some modifications have been made to these license sites. Following such modifications, the licenses bearing the numbers, İR:6410, İR:6411, İR:20066822 and İR:20066823, have been combined under a single license as the sites having License No's İR 20066824 and İR 16987 have been combined under a single license. No change has been made as regards the Site with License No İR 33838. The former licenses and combined licenses are provided by **Annex-4.**

3.1.2. Concentrator Facility

The Phosphate Concentrator Facility is located in the territories of the Village of Kocakent in the District of Mazıdağı, Province of Mardin. It is located at a distance of about 38 km to the Province of Mardin by air distance and at a distance of about 11 km to the center of the District of Mazıdağı by air distance.

The Location Direction Map showing the Project Area is provided by the following figure.

Figure 1 Location Direction Map

The Residential Areas which are nearest to the Project Area are the Village of Kocakent located 2.13 km northeast, Village of Karataş located about 2.7 km west, Village of Ekinciler located about 2.9 km southeast and Village of Sürendal located about 7 km northwest.

The Residential Areas nearest to the Project Area are provided below.

Figure 2 Satellite View Showing the Residential Areas Nearest to the Project Area

3.2. Planned Facilities

3.2.1. Integrated Fertilizer Facility

The Integrated Fertilizer Facilities are to be built as an integrated facility adjacent to the present Phosphate Concentrator Facilities.

The layout plan that shows both existing and planned facilities is given in **Annex-5**.

4. TECHNICAL SPECIFICATIONS OF THE PROJECT

4.1. Existing Facilities

4.1.1. Phosphate Mine Sites

There are a total of 7 phosphate sites with exploration licenses as part of the facility. Operation Licenses have already been obtained for 4 of them as no Operation Licenses have not yet been acquired for 3 of them. The licensed sites are provided by the following table.

Table 1 Licensed Sites According to the Operating Authorizations

Sites with Licenses, for Which Operation Authorizations Have Been Acquired	**Sites with Licenses, for Which Operation Authorizations Have Not Yet Been Acquired**
İR 6410	İR 20066822
İR 6411	İR 20066823
İR 16987	İR 20066824
İR 33838	

The licenses for the above mentioned phosphate sites having No's İR 6410, 6411, 16987 and 33838 were acquired before the date, 07.02.1993. Therefore, a Letter Confirming Exclusion from EIA Scope has been acquired for the subject license sites from Mardin Governor's Office Provincial Environmental and Urban Affairs Directorate as per Provisional Article 3 (as amended in Official Gazette Issue No 27905 of 14/4/2001) of the Regulation on Environmental Impact Assessment, which has taken force upon promulgation in Official Gazette Issue No 26939 of July 17, 2008, reading as follows: "The provisions of this regulation do not apply for the projects, for which application designs were approved or authorizations, licenses or approvals or expropriation decisions or local zoning plans were approved or obtained from competent authorities before EIA Regulation which has taken force upon promulgation in Official Gazette Issue No 21489 of 07.02.1993 or for such activities which are documents as having started operating before this date" and it is provided by **Annex -1**.

Several changes have been made as regards 7 license sites. Under these changes, the licenses bearing the numbers, İR:6410, İR:6411, İR:20066822 and İR:20066823, have been combined under a single license as the sites having License No's İR 20066824 and İR 16987 have been combined under a single license. No change has been made as regards the Site with License No İR 33838. The combined licenses are provided by **Annex-4**.

Material extracted only from the Site Having License No İR 33838 is used at the presently located concentrator facility. As long as operation of the facility would continue, material would be extracted from the Licenses having No's İR:6410, İR:6411, İR:20066822 and İR:20066823 which have been combined under a single license. The blasting pattern which has been prepared for these license sites are provided by the following table. It is not projected to extract material from the licensed site which is located in Diyarbakır.

4.1.2. Phosphate Concentrator Facilities

The concentrator facilities are such facilities where rocks obtained from the phosphate rocks undergo various operations to produce concentrate phosphate. The operations applied at the facilities are outlined below.

Pit-run material extracted from the pits through blasting operation is loaded on to the trucks and unloaded on to the bunker. The material at the bunker is transferred by the crawler feeder to the Jaw Breaker to be crushed into the required dimensions. The material which is turned into required dimensions at the Jaw Breaker is taken through the sieve (0-140 mm). The material which is taken through the sieve is transmitted to the Shuttle Conveyor via the Conveyor Belt. Sieved material is unloaded at Stock Site B.

The photographs for the present concentrator facility, which were taken during the visit to the site, are provided below.

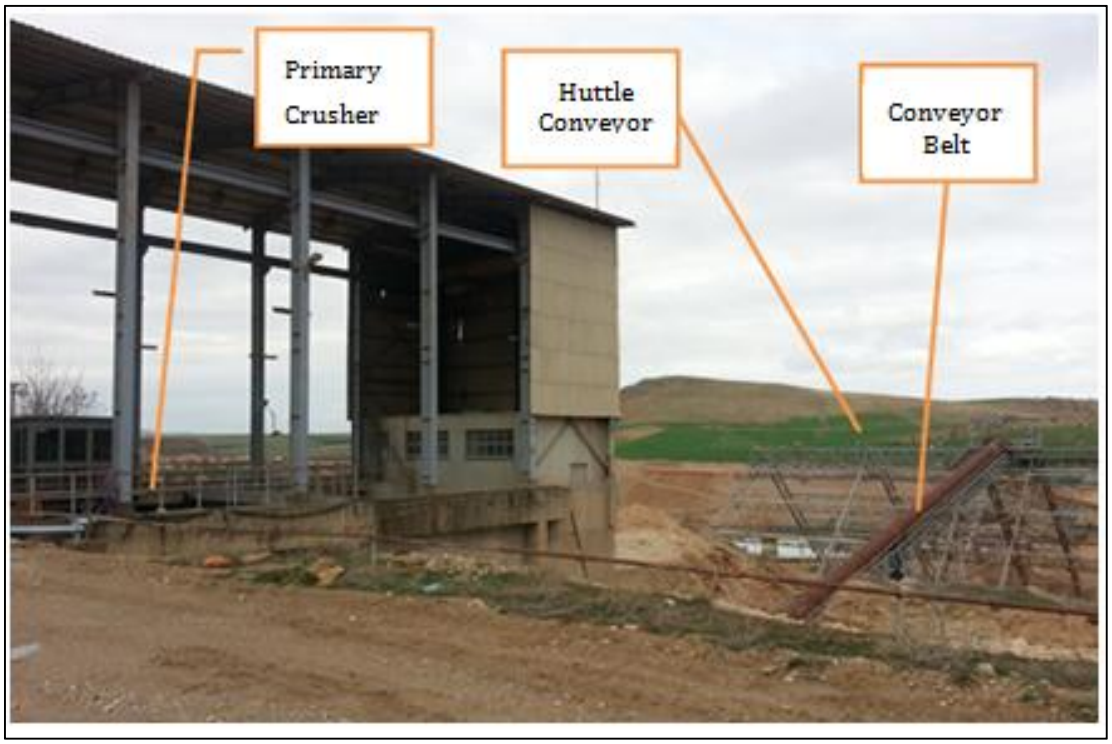


Figure 3 Primary Crusher and Shuttle Conveyor Belt

Figure 4 Bunker

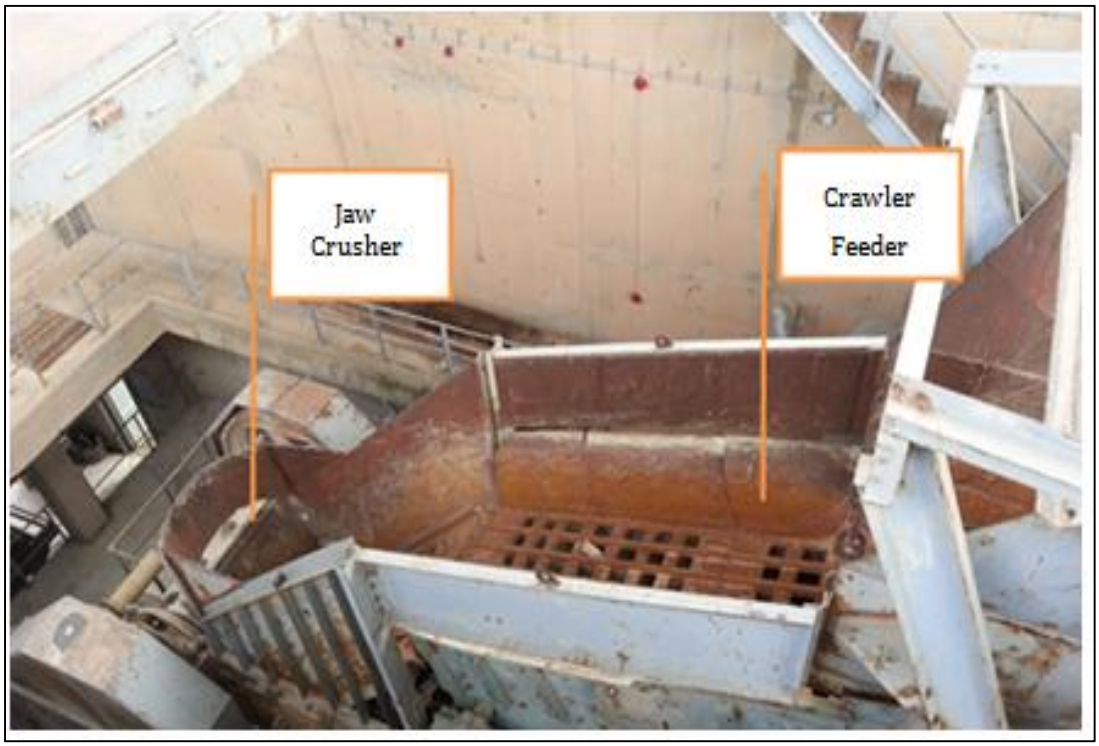


Figure 5 Jaw Crusher

Figure 6 Conveyor Belt

Figure 7 Shuttle Conveyor

Figure 8 Stock Area

Figure 9 Conveyor Belt 1 Which is Located Inside the Bunker

Figure 10 Conveyor Belt 2 which is Located Inside the Bunker

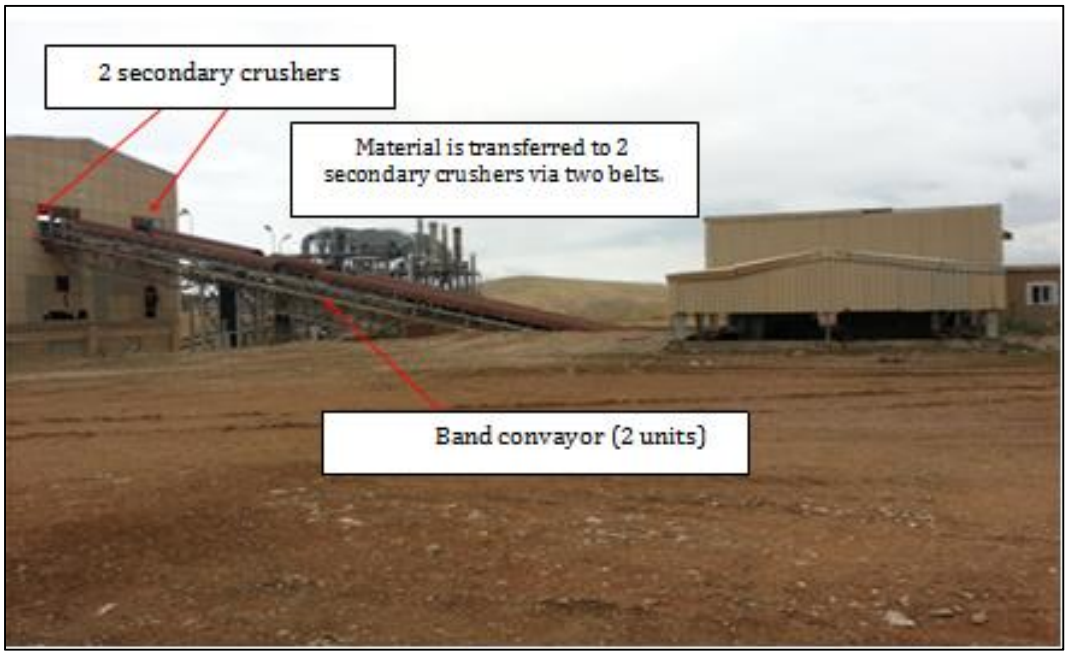


Figure 11 Secondary Crusher

On sieve material is taken by the conveyor belt to the bunker where it is taken by the belts to the washing tank. Under sieve material is sent by the conveyor belt to the waste area.

Figure 12 Sieve Yop and Bottom Material Belts

Figure 13 Bunker Into Which Sieve Top Material is Poured

On sieve material is taken by the belts to the rotary washers from the bunker. The material, which is washed at the rotary washer, then arrives at the sieve having the size of 1 mm. Under sieve material is sent to the pulp tank as on sieve material is sent to the coarse waste.

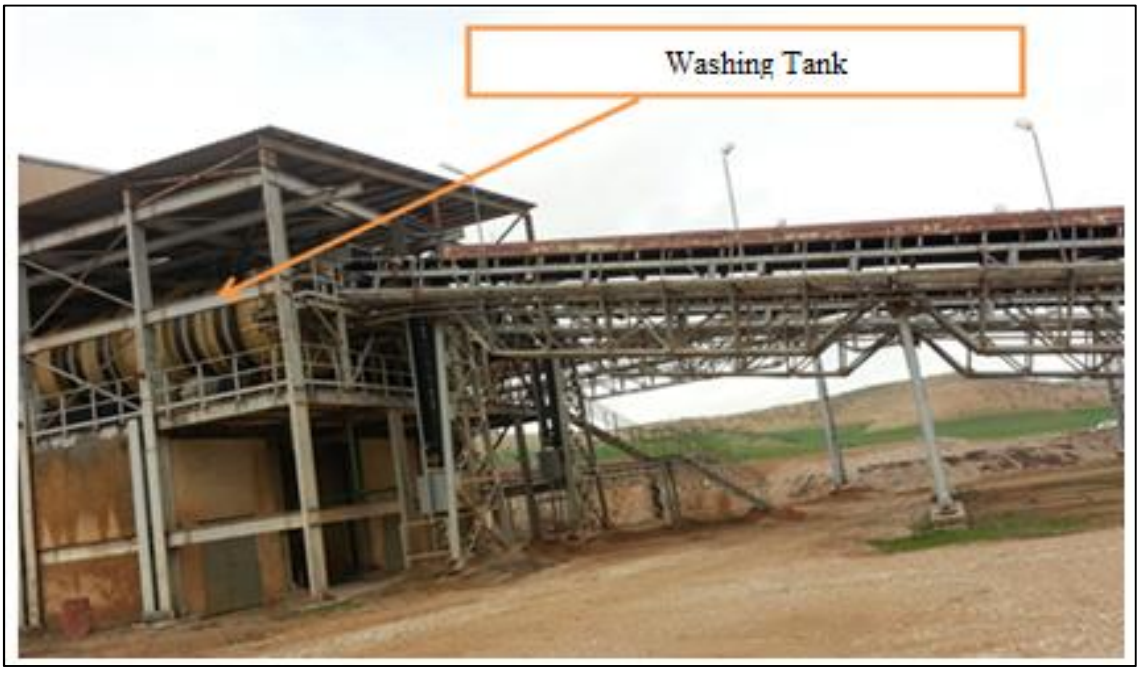


Figure 14 Washing Tank Building

Figure 15 Washing Tank

It is taken to 0.3 and 0.4 mm sieves with high frequency at Pulp Tank No 1. On sieve material is taken into the fine waste as under sieve material is taken into Pulp Tank No 2. From Tank No 2, it is fed into the quartet 350-scale hydro-cyclone. The material on the top section of the hydro - cyclone is taken into Pulp Tank No 4. Under cyclone material is taken into Pulp Tank No 5. As a result, the single and quartet hydro - cyclone sub-flow is taken on the vacuum belt filter cloth as a final product and further admitted into Stock Site H and drying unit via the belts. The 8-unit hydro-cyclone top flow goes to the thickener pool.

Figure 16 Hydro - Cyclone 1

Figure 17 Hydro - Cyclone 2

Figure 18 Tickener Pool

Following the washing operation, raw phosphate which is located in a wet condition in the storage area is transferred by the belts into the bunker where it is further transmitted to the furnace for the purpose of dehumidifying it.

Figure 19 Material Stock 1

Figure 20 Material Stock 2

The dehumidified raw phosphate is transferred to the storage site for packaging. It is projected to install a floatation plant in the forthcoming years for making use of coarse waste which could not be used at the storage sites.

Coal is used as fuel at the furnace. Ash generating from the furnace following the incineration operation is dumped at the location designated as the ash storage area.

Figure 21 Ash Storage Area

The phosphate concentrator facility mentioned above was concentrated the phosphate rocks than dried in order to supply to the market. When the planned facilities operate, the concentrated phosphate will be used in fertilizer production. The process of fertilizer production will conducted with wet method. Therefore, the drying process of phosphate concentration facility will not be used. The drying kiln and stack will not be operated. The coal will not be used and the ash occurrence will be gone away.

The flow diagram of Concentrator Facility is given below.

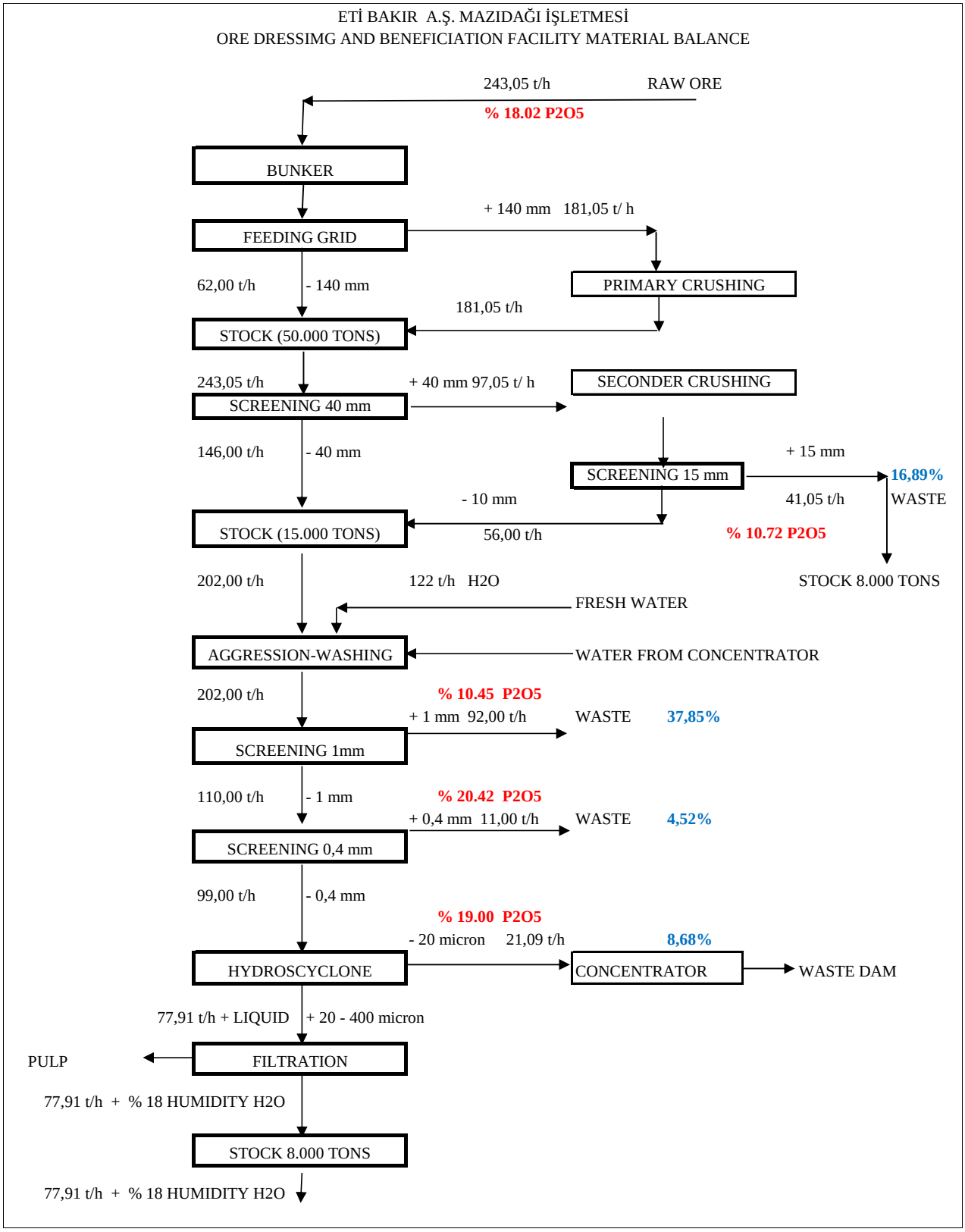


Figure 22 Flow Diagram of Concentrator Facility

4.2. Planned Facilities

Eti Bakır A.Ş has planned to install a fertilizer facility which is integrated into the concentrator facility, which is presently located, by also taking into consideration Turkey's increasing fertilizer requirements. DAP and NP fertilizers are the basic products to be produced as part of the Integrated Fertilizer Facility. Other production would also be carried out at the intermediary levels for production of these fertilizers and feedstock requirements would be met by the company internally.

The main inputs and products of the Integrated Fertilizer Facility are shown below.

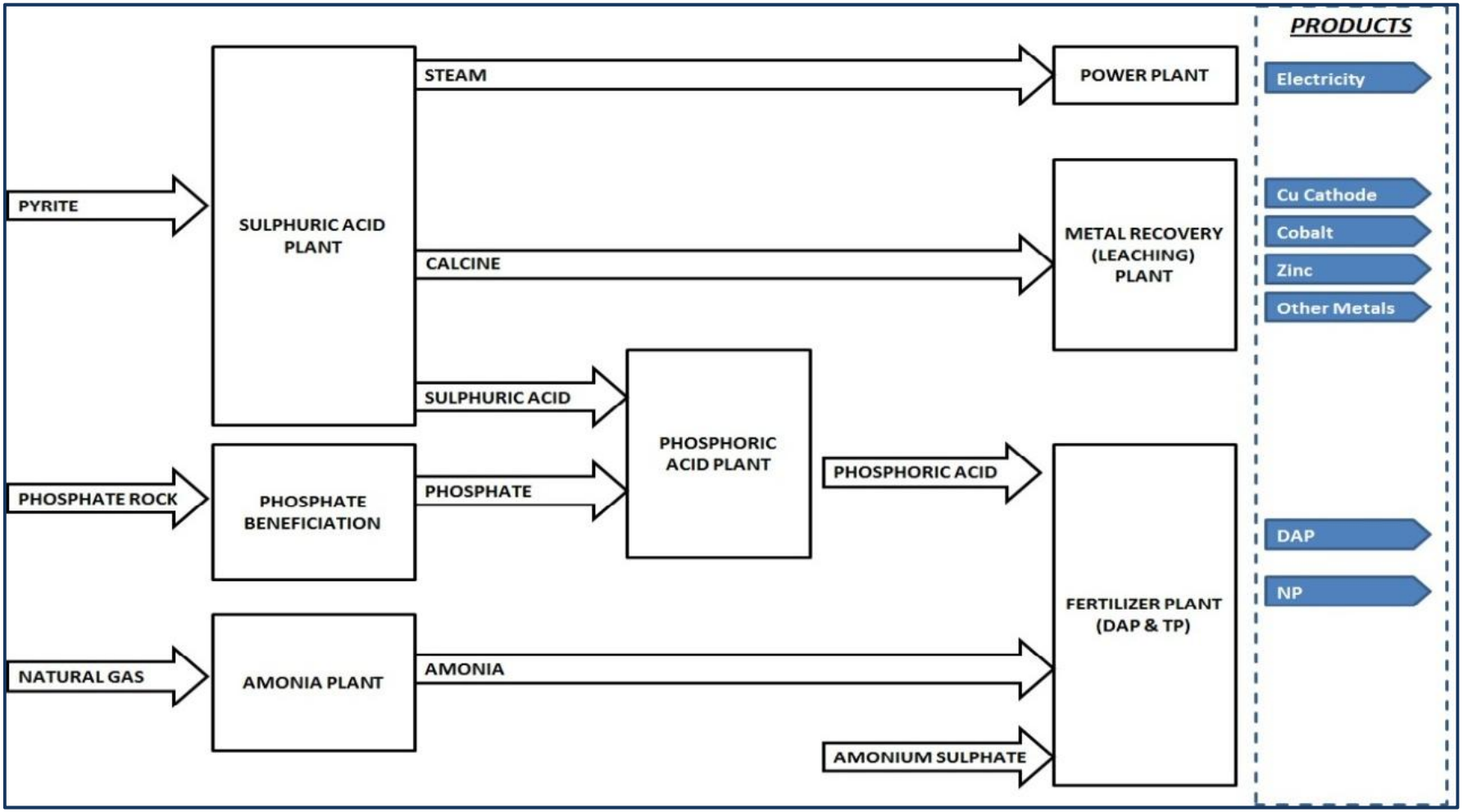


Figure 23 Facility Overall Inputs and Outputs

All the productions, which would be carried out at the facility, are explained in detail below. The process flow charts are given in **Annex-6**.

4.2.1. AMMONIA PRODUCTION

Ammonia production would be achieved by using natural gas. Natural gas to be required would be met from Bismil - Mardin Natural Gas Pipeline. It is planned to produce 90.000-100.000 tons of ammonia annually.

Ammonia production from natural gas is achieved by means of the following major reactions.

0,88 CH4 + 1,26 Air + 1,24 H2O ==> 0,88 CO2 + N2 + 3H2

N2 + 3H2 ==> 2NH3

Production of synthesis gas from natural gas is the first operation to be made for ammonia production. Synthesis gas production and purification of such gases take place at a pressure of 25 - 35 bar. The pressure required for ammonia synthesis is generally at the range of 100 - 250 bar. The intermediary steps in production of ammonia from natural gas are detailed below.

Supply gas desulfurization

It refers to the operation of eliminating sulfur contained inside natural gas so that the catalysts present in the process would not suffer damages. Supply gas is heated up to 350 - 400 0 C and taken through the catalyst of cobalt - molybdenum and subsequently adsorbed on zinc oxide on which sulfur is pelletized. The reactions at which the operation takes place are provided below.

R-SH + H2 ==> H2S + RH

H2S + ZnO ==> ZnS + H2O

Hydrogen gas required for this reaction is generally met by recycling gases arriving from the synthesis compartment.

Reformer 1

The gas getting out of the desulfurization unit is heated up to 500 - 600 0 C before it enters into Reformer Unit 1. The reformer comprises the nickel - chromium alloy tubes containing nickel catalyst. The reaction here is endothermic and additional temperature is required in order to increase the output temperature up to a temperature of 700 - 830°C.

The composition of the gas leaving the initial reformer is as indicated in the following chemical equation.

CH4 + H2O <==> CO + 3H2

CO + H2O <==> CO2 + H2

Reformer 2

Only 30 - 40 % of hydro - carbon supply converts due to the chemical balance in the operating conditions at Reformer 1. The temperature must be raised in order to increase conversion. This takes places at the second reformer. Supplying process air to the reformer supplies nitrogen for final synthesis and at the same time, it ensures conversion of hydro carbons.

Here, process gas is mixed with air inside the churner and later, it is taken via the second reformer catalyst containing nickel and its temperature is raised to 1000 0 C as conversion reaches 99 %.

Process gas is cooled down to 350 - 400 0 C in the waste heat boiler.

Converter

The gas getting out of the second reformer contains 12 - 15 % CO and is converted in the shift converter according to the following reaction.

CO + H2O <==> CO2 + H2

The gas containing carbon monoxide is taken through the oxide / chromium oxide catalyst bed at 400 0 C so that carbon monoxide is reduced to about 3 %.

By using the catalyst containing copper, CO volume is reduced to 0.2 - 0.4 %. For this purpose, gas is again reduced down to 200 - 220 0 C and taken through the copper oxide / zinc oxide catalysts so that residue CO is eliminated.

CO2 Elimination

The gas getting out of the converter contains H2, N2, CO2 and steam. This gas is cooled and surplus steam is condensed before it gets into C02 lifting system. C02 lifting process takes place through a chemical reaction. The solvent used here is basically an amine based water solution. This solution is eliminated by adsorbing it with C02.

Methanator

Because CO and CO2 remaining inside the synthesis gas would be harmful to the catalyst used for the ammonia synthesis, they must be eliminated by converting them into CH4 inside the methanator. This operation takes place through the following reactions.

CO + 3H2 ==> CH4 + H2O

$$CO2 + 4H2 ==> CH4 + 2H2O$$

The above reactions take place at the reacted filled with the nickel containing catalyst at 300°C. Methane is an inert gas having synthesis reaction but must be removed through condensation before it enters into the converter.

Ammonium Synthesis

The ammonium synthesis takes place in the case of the following reaction in the presence of iron catalyst at a pressure of 100 - 250 bar and temperature of 350 - 500 0 C.

$$N2 + 3H2 <==> 2NH3$$

The ammonium obtained is to be cooled at a temperature of -33.3 degrees and subsequently stored as a liquid.

The ammonium production flow diagram is provided by **Annex-6A.**

4.2.2. PHOSPHORIC ACID PRODUCTION

Feedstock for phosphoric acid production is to be met from the present concentrator facility. It is planned to produce 200.000-220.000 tons of phosphoric acid annually.

Phosphoric acid required at the stage of initial startup of the facility is to be supplied from TOROS TARIM A.Ş. in Samsun.

The production steps are explained in detail below.

a) First Mixture and Melting

Phosphate having average 30 P2O5 concentration which is produced at the present phosphate concentrator would be taken into the bunker at the phosphoric acid production plant. It would be weighted on the dosage belt under the bunker and sent to the first mixer (pre-mixture) at capacity of 68 tons/hour. At the facility, there would be 2 pre-mixers, of which one of them would be in the operating condition, and the other would function as a stand-by unit. Phosphoric acid would be pressed into the pre-mixer at 20 % concentration and mixed with phosphate at the same time. The mixture in the form of sludge, which gets out of the pre-mixer, would be taken into the Melting Tank (Digester 1). Sulfuric acid would be pressed into the mixture at capacity of 80 tons/hour and 70 % concentration here and mixture would be maintained afterwards. The mixture operation would continue by taking into Melting Tanks II, III and IV in this order. In the meantime, if considered necessary, some volume of sulfuric acid would be pumped into Melting Tank II. There would be 4 units of digesters at the facility. In case of failure which could take place in any of the digesters, it would be possible to operate with 3 digesters at 100 % capacity.

The gases generated during these operations would be taken through the washing tower and then, pumped into the facility main stack via a fan.

b) Crystallization

The fluid at about 90 0 C, which generates after the operation of mixture and melting in the digesters would be admitted into the Crystallization tank. As the mixture operation continues in the Crystallization tank, it would be ensured that the fluid would be cooled down by blowing fresh air into the tank by means of a fan at the same time. This operation would also continue in Crystallization Tanks II, III, IV and V in this sequence. Thanks to this, it would be ensured that calcium and sulfate inside the solution would combine and form calcium sulfate in the form of crystal. There shall be 5 Crystallization tanks at the facility. It would be possible to operate at 100 % capacity with 4 Crystallization tanks in case of failure which could take place in any of these tanks.

After air blown into the Crystallization tanks and getting dirty subsequently is washed at a washing tower, it would be pumped into the facility main stack by means of a fan.

c) Filtration

The mixture at Crystallization Tank V shall be pumped into the rotary vacuum filter by means of a pump. Phosphoric acid inside the mixture pumped into the filter would be absorbed by means of a vacuum pump and separated from calcium sulfate crystals. Calcium sulfate crystals remaining on the filter would be scraped off by means of a scraping spiral and transported by means of the conveyors and taken out of the facility. The rotary vacuum filter would comprise 3 zones. Phosphoric acid adsorbed from Zone I has 28 - 30 % concentration and would be taken into the storage tank. Phosphoric acid adsorbed from Zone II has 20 - 22 % concentration and would be used to turn phosphate into sludge in the premixer tank. Low concentrate phosphoric acid adsorbed from Zone III would be used as washing acid for Zone II.

Phosphoric acid adsorbed by the vacuum pump from the filter would go through the recipient (liquid - gas separator) tanks and be separated from gases and taken into the tanks according to the utilization condition. Gases would be released into the atmosphere after they would be washed by a washing system.

Phosphoric acid having 28 - 30 % concentration, which is taken from Zone I of the filter, would be admitted into the desulfatation tank before it would be taken into the storage tank and depending on the free sulfur volume inside it, it would be mixed with some volume of phosphate so that it would ensure that sulfuric acid would neutralize.

The solid substances inside phosphoric acid which would later be taken into the settlement tank would be caused to settle down. Phosphoric acid would then be taken into 30 % acid storage tank from that point.

$$Ca10F2(PO4)6+ 10H2SO4+ 5H2O ==> 10CaSO4.1/2H2O + 6H3PO4 + 2HF$$

d) Evaporation

Evaporation refers to the operation of heating phosphoric acid having 30 % concentration and increasing concentration to 54 %. During this operation, Fluor inside phosphoric acid is thus purged. In this operation, phosphoric acid would be taken through a piped heat exchanger and heated with steam so that water contained in it would be evaporated. Phosphoric acid, the concentration of which has been increased, would then be taken into the acid storage tank. Steam would be absorbed by a vacuum pump and released into the atmosphere after it would be washed at the washing tower.

The phosphoric acid production flow diagram is provided by **Annex-6B** hereto.

4.2.3. SULFURIC ACID PRODUCTION

Pyrite is the raw material which is needed for sulfuric acid production. The pyrite to be used at the facility would be supplied from Eti Bakır A.Ş Küre Works located in Kastamonu. Sulfuric acid which is need for initial startup of the Facility would be transported by tankers from Eti Bakır A.Ş Sulfuric Acid Facility in Samsun to the Project Area. It is planned to produce about 650.000-750.000 tons of sulfuric acid annually.

The production steps are explained in detail below.

a) Pyrite Parching

Pyrite to be used in sulfuric acid production would be taken by the conveyors from the main pyrite storage premises into a bunker. Pyrite containing 40 - 42 % sulfur, which is to be weighed at the bunker outlet, would be sent to the fluidized bed parching unit at a capacity of 57 tons/hour. Pyrite would be parched in the fluidized bet parching unit with the aid of air oxygen so that SO2 formation would be ensured.

$$4FeS_2 + 11O_2 \xrightarrow{850\text{-}1000^0C} 2Fe_2O_3 + 8SO_2$$ Parching reaction

b) Dry Gas Cleaning

SO2 gases getting out of the fluidized bed parching unit would arrive at the waste heat boiler. The outer wall of the waste heat boiler is equipped with piping through which hot water is circulated. While getting through this section, gas would cool down and at the same time, would be freed of a portion of ash inside it. Gas temperature, which is 900 - 950 0 C while entering the waste heat boiler, would be 300 - 375 0 C while getting out out of the boiler. As SO2 gas is cooled down in the waste heat boiler, hot water circulating through the pipes on the boiler wall would also be heated so that hot vapor would be generated at a pressure of 43 ATU and a temperature of 450 0 C. This vapor would be sent to a vapor turbine to produce electric energy. Thus, about 35 MWe/125 MWt of electricity would be generated.

S02 gas would be taken through the cyclones after the waste heat boiler so that it would be ensured that a portion of ash and dust inside it would further be retained. S02 gas comes to the electro-static filter from the cyclones. Here, ash and dust particles remaining inside the gas are settled by means of high voltage so that they are purged from S02 gas.

Ash which is separated from S02 gas in the waste heat boiler, cyclones and electrostatic filter would be transported to a rotary cooler. Here, the ash cooled down is pelletized if necessary and then pyrite ash would be stored at the storage site; after cobalt, copper and zinc contained in it are removed in the leach unit, it would be sold to the factories as a cement additive.

Detailed information about the Leach Facility is provided by Part 5.2.1.6.

c) Wet Gas Cleaning

S02 gas which is cleared of a significant portion of solid substances contained in it in the dry gas cleaning part must be cleared in a wet condition depending on its physic-chemical composition. For this purpose, S02 gas is sent to the venture gas washing tower where it is to be washed and cleared of a further portion of solid substances in it. S02 gas which is subsequently taken through the gas cooling tower and heat exchangers is to be cooled down to 35 - 40 0 C. A large volume of fog would take place in S02 gas after it is washed and cooled. Then, S02 would be taken through wet electro-static filter so that fog would be condensed through high voltage. S02 gas getting out of wet electro-static filter would thus be thoroughly cleared of foreign substances both physically and chemically and exhibit a clear appearance.

d) Drying gas

Cleaned S02 gas must be dried up so that it could be converted into S03 initially and then into sulfuric acid. For this purpose, S02 gas would be sent to a tower, the interior of which is filled with rushing rings. Sulfuric acid having 96 % concentration would be sprayed on S02 gas, which enters inside the tower, from above. By ensuring full contact of S02 gas with sulfuric acid inside the tower, de-humidification of gas would further be ensured. S02 gas which passes through Teflon mesh filter on the outlet of the drying tower would also be cleared of sulfate acid particles contained in it.

e) Sulfuric acid production

Sulfuric acid production at the facility would be achieved by the dual contact and dual absorption method. S02 gas at a temperature of 35 - 40 0 C, which is absorbed by a blower from the drying tower, would be taken through cold gas heat exchanger 1 and hot gas heat exchanger 1 in this order and heated up to 430 0 C and finally taken to converter tower stage I. 70 % of S02 gas which passes through the catalyst (vanadium) here is converted into S03 as its temperature would rise to 600 0 C. Gas which gets out of Converter Stage I would pass through hot gas heat exchanger 1 and cooled to 430 0 C and then taken to converter stage II. As gas passes across the catalyst here, its temperature would rise to 500 0 C and 90 % of S02 gas would be converted into S03. Gas getting out of Converter Stage II would be taken

hrough hot gas heat exchanger 2 and its temperature would be reduced to 430 0 C and finally taken to Converter Stage III. As it passes across the catalyst here, its temperature would rise to 460 0 C and 95 % of S02 gas would be converted into S03.

$$SO_2 + \frac{1}{2} O_2 \xrightarrow{V_2O_5} SO_3 \quad \text{(Catalytic Oxidation)}$$

Gas getting out of Converter Stage III would be taken across cool gas heat exchanger 2 and cooled to 335 0 C. Gas which is later taken across the economizer and cooled down again would then be taken via Absorption Tower I at a temperature of 170 0 C. The structure of Absorption Tower I is same as that of the drying tower. Gas which gets through the rashing rings here would contact sulfuric acid having 98.5 concentration and S03 gas would turn into sulfuric acid. Gas which gets out of Absorption Tower 1 at a temperature of 70 - 80 0 C would later be taken through cool gas heat exchanger 2 and hot gas heat exchanger 2 and its temperature would be consequently increased to 405 0 C. Later on, it would be taken to Converter Stage IV. As the temperature of gas which passes across the catalyst here rises to 425 0 C, 99.85 % of total S02 would be converted into S03. Gas getting out of Converter IV would be taken across cool gas heat exchanger 1 and heater + economizer and its temperature would be lowered to 170 - 180 0 C. Gas which is sent to Absorption Tower II from here contacts sulfuric acid having 98.5 % concentration as is the case for Absorption Tower I and S03 contained in it would be converted into sulfuric acid entirely.

$$SO_3 + H_2O \rightarrow H_2SO_4 \quad \text{Absorption}$$

Gas, the temperature of which is lowered to 80 - 85 0 C and S02 content falls below admissible values is to be released into the atmosphere from the stack. Sulfuric acid obtained from Absorption Towers I and II would be taken into the storage tanks after it is cooled down.

Absorption Tower I at this facility is used for the purpose of heat recovery at the same time. Vapor obtained as sulfuric acid is cooled here is used in energy generation.

Sulfuric acid production flow diagram is provided by **Annex-6C.**

4.2.4. FERTILIZER PRODUCTION

The fertilizer production facility to be built would produce DAP (diammonium phosphate) fertilizer or composed fertilizer NP.

a) Composed Fertilizer NP (20.20.0) Production

Composed Fertilizer NP/NPK is a fertilizer containing nitrogen, phosphate and potassium.

Ammonium and phosphoric acid which is heated and converted into gas for production of this fertilizer would be pumped into the pipe reactor at the same time. Sludge which is obtained in

the pipe reactor would be sent to the granulation drum. At the same time, the return product (dust collected from the dust cycles, small size fertilizer taken from the fine sieve bottom and fertilizer failing to pass through the coarse sieve, which is crushed by the crusher) ammonium sulfate fertilizer, which is weighed on the solid system, would also be fed into the granulation drum. The product, which gets mixed and turn into a granulated form through rotation at the granulation drum, is at a temperature of 90 - 95 0 C at the outlet of the drum and contains 5 - 6 % humidity. The product which arrives at the drying drum would be dried up by hot air coming from the combustion chamber as it rotates inside the drum. The product getting out of the drying drum would be sent to the coarse sieve with the aid of transport elements. As the grains larger than 4 mm is sent to the crusher to be crushed, the grains below 4 mm would pass through the fine sieve. The product between 2 - 4 mm would be taken on to the fine sieve and sent to the cooling drum by means of the transport elements. The product which would be cooled by outer setting air to some extent at the cooling tower would then be sent to fluidized bed cooler. The product which would be further cooled by outer setting air here would arrive at the dusting / powdering drum. The product, which is coated by anti-caking agents here, would be sent to the fertilizer stock warehouses with the aid of transport elements.

After gases generating at the granulation drum at the facility would be washed first at the granulation gases washing pipe and then at Washing Towers II and III, they would later be absorbed by a fan and released into the atmosphere from the stack. The dusty combustion air absorbed from the drying drum would be likewise washed and released into the atmosphere from the stack. In addition, dusts contained in the cooling air at the cooling tower at the facility, dusts contained in the cooling air at the fluidized bed cooler and dusts absorbed from the apparatuses at the facility (elevators, conveyors, crushers, sieves, etc.) would be separately filtered and retained.

Dusts retained from the filters, large grained fertilizer crushed by the crusher and fertilizer smaller than 2 mm, which gets under the fine sieve, would be fed into the granulation drum as the return product.

b) DAP (Diammonium Phosphate) Fertilizer Production.

DAP(18.46) fertilizer is a type of fertilizer having 18 % nitrogen and 46 % phosphate in its contents by weight. Main ingredients used in production of 1 ton of DAP fertilizer are 220 kg of ammonium and 460 kg of phosphoric acid. Phosphate would be used as additive in this fertilizer.

Ammonium and phosphoric acid which is heated and converted into gas for production of this fertilizer would be pumped into the pipe reactor at the same time. Sludge which is obtained in the pipe reactor would be sent to the granulation drum. At the same time, the return product (dust collected from the dust cycles, small size fertilizer taken from the fine sieve bottom and fertilizer failing to pass through the coarse sieve, which is crushed by the crusher) would also be fed into the granulation drum. The product, which gets mixed and turn into a granulated

form through rotation at the granulation drum, is at a temperature of 90 - 95 0 C at the outlet of the drum and contains 2 - 2.5 % humidity. The product which arrives at the drying drum would be dried up by hot air coming from the combustion chamber as it rotates inside the drum. The product getting out of the drying drum would be sent to the coarse sieve with the aid of transport elements. As the grains larger than 4 mm is sent to the crusher to be crushed, the grains below 4 mm would pass through the fine sieve. The product between 2 - 4 mm would be taken on to the fine sieve and sent to the cooling drum by means of the transport elements. The product which would be cooled by outer setting air to some extent at the cooling tower would then be sent to fluidized bed cooler. The product which would be further cooled by outer setting air here would arrive at the dusting / powdering drum. The product, which is coated by anti caking agents here, would be sent to the fertilizer stock warehouses with the aid of transport elements.

After gases generating at the granulation drum at the facility would be washed first at the granulation gases washing pipe and then at Washing Towers II and III, they would later be absorbed by a fan and released into the atmosphere from the stack. The dusty combustion air absorbed from the drying drum would be likewise washed and released into the atmosphere from the stack. In addition, dusts contained in the cooling air at the cooling tower at the facility, dusts contained in the cooling air at the fluidized bed cooler and dusts absorbed from the apparatuses at the facility (elevators, conveyors, crushers, sieves, etc.) would be separately filtered and retained.

Dusts retained from the filters, large grained fertilizer crushed by the crusher and fertilizer smaller than 2 mm, which gets under the fine sieve, would be fed into the granulation drum as the return product.

The fertilizer production flow diagram is provided by **Annex-6D.**

4.2.5. FERTILIZER PACKAGING FACILITY

The packaging facility would comprise 5 lines each with a capacity of 40 tons/hour. Fertilizer, which would be transported to the packaging facility by means of transport elements from the fertilizer stock warehouses, would be sieved by a sieve. Fertilizer remaining on the sieve, which has standard grain sizes, would be taken into the bunkers.

The bags, the mouths of which would be sewn, would be carried to trucks by means of transport elements and stowed there.

Substances generated by the equipment at the facility (sieves, conveyors, bunkers, etc.) would be absorbed by a fan, filtered and retained. Dust retained by filter and fine fertilizer particles getting under the sieve would be sent to the feedstock warehouses by means of transport means.

4.2.6. LEACHING FACILITY

Leaching operation refers to the operation by which metals inside low grade ore are turned into metal solutions by means of solvents and subsequently, metals are settled. The leach unit to be built at the facility would achieve removal of precious metals from pyrite ash.

Pyrite ash is the feedstock to be used at the Leach Facility. In addition, auxiliary inputs would also be used in production. They are ground limestone, slaked lime, sodium carbonate, caustic, vapor and sulfuric acid.

The operations to be achieved in the unit are explained below.

Leaching operation: Cobalt, copper and zinc would be dissolved by leaching pyrite ash extracted from sulfuric acid parching with sulfuric acid through use of oxygen under pressure at high temperature at the autoclave.

Solution treatment: Some impurities particularly iron contained in leach solution would be settled and separated by using oxygen in a tank. Pre-settlement solution pH would be increased to 2 - 3 by using lime. Lime to be used would be procured from local markets.

Cathode copper production: Copper would be recovered from the solution, which is cleared of iron and other impurities, by means of the operation, 'Solvent extraction + Electrowinning'(SX+EW).

Zinc Carbonate Production: There are zinc and cobalt in the solution obtained from cathode copper production. Rich solutions of these elements would again be obtained by the operation, 'Solvent extraction + Electrowinning'(SX+EW), first. Later on, first ZnCO3 and later CoCO3 would be produced by settling these solutions through use of soda ash respectively. Soda to be used would be procured from local markets.

As a result of the above specified operations, about 2.400-2.500 tons of cobalt carbonate (CoCO3) with purity of about 98 %, 2.000-2.200 tons of cathode copper (Cu) with purity of > 96 % and 900-1.000 tons of zinc carbonate (ZnCO3) with purity of about 98 % would be obtained. About 350.000-400.000 tons of leach cake which would remain from ash as a result of the process are hematite containing 50 - 55 % iron and could be used by the local cement or smelting facilities as feedstock.

The flow diagram showing the productions made at the Leach Facility is provided by **Annex-6E.**

5. ENVIRONMENTAL AND SOCIAL BASELINE

5.1. Physical Environment

5.1.1. Geology and Geomorphologic Characteristics

5.1.1.1. Regional Geology

Cambrian and Older Formations

On the Arabian block, this formation is observed only at Kermik, Sadan and Telbismi in the District of Derik, Mardin. It is generally composed of sand Stones, conglomerates and red diagonally layered sand Stone and shales. [4]

Cretaceous Period

Jurassic – Lower Cretaceous Age limestone units crop out at such locations where Eocene and Paleocene formation suffered abrasion as Upper Cretaceous marl and clay crop out at the basins of Kentalan, Espandika, Gercüş, Hermis, Kerbent in the surroundings of the District of Mazıdağı, Mardin. The Cretaceous limestone units the thickness of which declines towards the West has a thickness of 400 meters in the District of Mazıdağı, Mardin.

Üst Kretase (Mardin Formasyonu) Upper Cretaceous Elements (Mardin Formation)

It is generally in the form of Marl sandstones and shale elements situated on the Upper Cretaceous – Paleocene and Senonian limestone units at a depth of up to 200 meters in the Mardin and Mazıdağı Region.

Middle Eocene elements (Midyat Formation)

Because the most characteristics development of Eocene limestone elements having a wide area of transgression in the Southeastern Anatolia Region was first seen in Midyat Plateau, this Eocene limestone combination was called Midyat Formation. It is generally in the form of yellowish and light brown / camel's hair color silex modulated stratified condition as it is in the form of light red chalky and occasionally gargoyle on the upper surfaces. Its thickness is approximately 270 – 350 meters.

Eocene limestone units extending across Mardin Block to a large extent are of Midyat Limestone type exposed on their edge curls and its lower stretch contains a rich fauna of nummulites containing much fossil. It may be divided to three major levels on Mardin Block from bottom to the top:

Tightly textured limestone unit which is solid and gray cream in color

Marl level

[4] Mardin Provincial Environmental Status Report, 2011

White chalky limestone unit

Neocene (partially marinal, partially continental)

This formation, which developed along the Syrian border with its lower sections in the marinal part and with its upper sections in the continental facies, covers expanse areas. As there are Miocene Age limestone units in its lower stretches, there are clayish and gravely layers on the upper levels covering Paleocene and intermittently Quaternary elements.

1/100,000 Scale General Geological Map showing the Project Area is provided by **Annex-7**.

5.1.1.2. Project Area and Impact Area Geology

In the region, the following crop out: Coniacian – Early Campanian Age Mardin Group in connection with the South-Eastern Anatolian autochthonous unit and Karababa Formation associated with this group and Campanian Age Adıyaman group and Karaboğaz Formation associated with this group, Early Miocene Age Kapıkaya Formation and Middle – Late Miocene Age Şelmo Formation. On top of all of these units, Kuşdoğan basalt, Seyran basalt, Hırkapınar basalt, İnanözü basalt, Çelkanyayla Basalt and Mergimir pyroclastics of the Pliocene – Quaternary Age Karacadağ group formed by the second phase of Karacada volcanites and Hama basalt, Leblebitaşı basalt, Görgü basalt and Kırmızıtepe pyroclastics as well as ancient and new alluvia are situated. [5]

Stratigraphic Geology

The stratigraphic units which are situated in the Project Area are provided below according to Section Maps M44 and N44 prepared by MTA General Directorate:

Mardin Group (Km)

Karababa Formation (Kmk)

The formation covering dolomitic limestone at the bottom, sporadic gargoyle limestone in the middle and limestone elements at the top was named by Gossage (1956).

Karababa Formation is mainly composed of limestone, dolomitic limestone and gargoyle limestone. The formation covers gray color dolomitic limestone elements having thick and apparent layering at the bottom. Medium – thick, sporadically finely layered, beige color gargoyle limestone elements are situated on these dolomitic limestone units.

The bottom and top relationship of Karababa Formation exhibits discordance throughout the Southeastern Anatolia Region. However, it harmoniosly surfaces across Derdere Formation of

[5] 1/100.000 Scale Turkey Geological Maps Diyarbakır Map Section M44, MTA General Directorate, 2011

Mardin group in some areas. In some areas, Karaboğaz Formation harmoniously exists and extends.

Adıyaman Group (Ka)

It is composed of rock types such as Pelagic limestone, cherty limestone, argillaceous limestone, shale, siltstone, claystone, marl. The name, Adıyaman, was first used by Gossage (1956) as Adıyaman Gravel Roup term for Pliocene – Quaternary Age fractured sediments in Adıyaman surroundings. The typical cross section of Adıyaman group is traced in the surroundings of Karababa Mountain 32 km South of the Province of Adıyaman.

The group which is considered being of Campanian Age settled in the deep sea – shallow sea – bank / reef media.

Alluvia (Qal)

It is composed of unbonded or loosely bonded clay, sand, gravel, silt and mud deposited in the stream beds, sedimentary areas and plains.

5.1.1.3.Seismicity

The Project Area is situated in Degree 3 Earthquake Belt according to the Map of Earthquake Zones in Turkey (1996) prepared by the Ministry of Public Works and Housing. No earthquakes took place in the Province of Mardin in the last 7 years.

With respect of any kinds of structures to be built in the said area, particular consideration shall be paid to the principles which are laid down by “Regulation on Structures To Be Built in Disaster Zones” dated September 2, 1997 as amended on July 2, 1998, and in the Regulation on the Buildings To Be Built in Earthquake Zones (2007) at the stage of final designs.

The seismicity (earthquake risk) map for the Province of Mardin is shown by the following map as the live fault map (2012) showing the Project Area is provided by **Annex-8.**

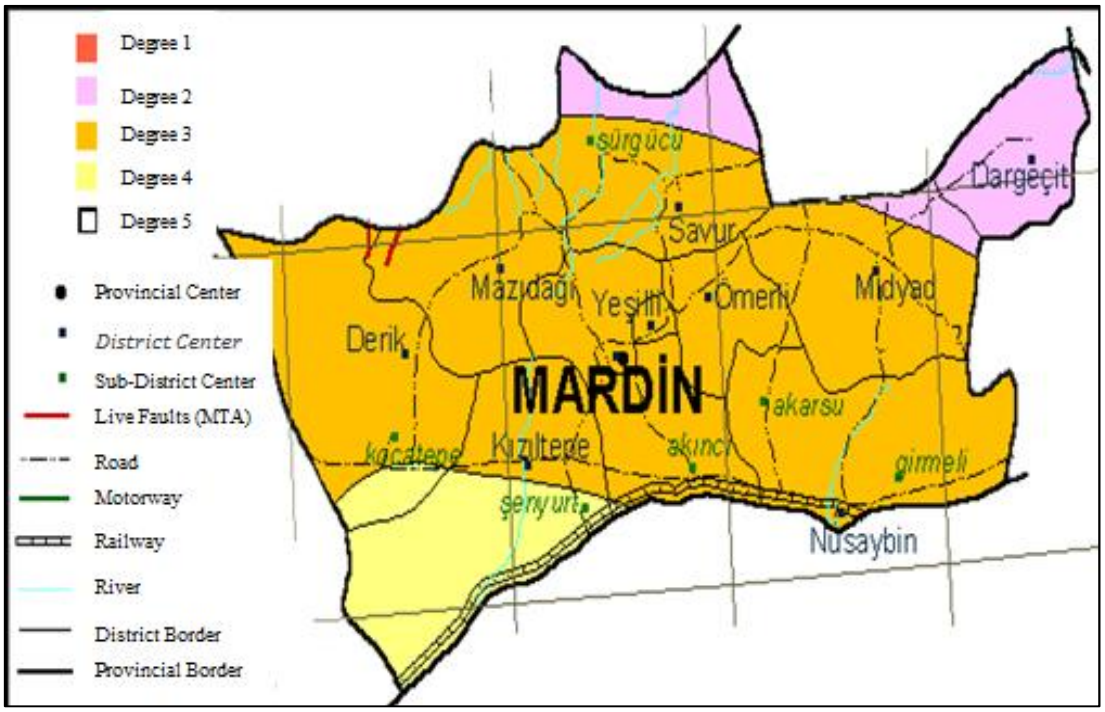


Figure 24 Earthquake (Seismicity) Map of the Province of Mardin

5.1.2. Hydrogeology

Ground water reserves have been discovered in an area of 3,000 dekar (1 dekar = A thousand square meters; 0.247 acres) in the North and northwest of the District of Kızıltepe in the Province of Mardin and total reserves of this water resource has been determined at 13,106 m3/year. The volume of water extracted from approximately 3,500 wells bored in this ground water reservoir is used for arable land irrigation as well as for drinking water requirements. The said ground water deposit is situated in the shallow depths in Kızıltepe Plain and the regime of the water surfaces is entirely dependent on local characteristics. Supply into ground water deposit is generally in the form of precipitation supplies and surface runoff leakage into ground. According to the most recent research made in connection therewith, there are about 7000 boring wells in the province. [6]

There are two boring wells in the District of Mazıdağı and used to supply drinking water. The total capacity of the wells is 876 m3/day.

4 boring wells have been dug for the purpose of supplying water under the project and Ground Water Utilization Certificate has been acquired from Regional Directorate No 10 of DSİ (State Hydraulic Works) in connection with these wells. In addition, ground water chemical analyses have been conducted at these wells. 6 more boring wells would be bored at the stage of final designs depending on the status of requirements and then, Ground Water Utilization Authorization Certificates would be accordingly acquired in connection therewith.

[6] Mardin Provincial Environmental Status Report, 2011

Annex-9 provides the Ground Water Utilization Authorization Certificates for the wells, well logs, pump trial forms and chemical analysis reports.

The following table provides the hydro-geological characteristics of 4 ground water wells dug.

Table 2 Hydrogeological Characteristics Of The Wells Dug

Well DSİ No	**Depth (m)**	**Flow Rate**		**Static Level (m)**	**Dynamic Level (m)**	**Volume of Water To Be Drawn (ton/day)**
		(l/s)	**(ton/day)**			
10-06 530	500	27	2332.8	100	290	10-06 530
10-06 636	450	28	2419.2	75	280	10-06 636
10-06 681	450	29	2505.6	100	290	10-06 681
10-00 190	470	29	2505.6	100	300	10-00 190

The locations of the above mentioned wells are shown by the following figure.

Figure 25 Map Showing the Locations of the Wells

5.1.3. Soil Characteristics

Province of Mardin

Agricultural land in the Province comprises Nusaybin Plain, Mardin Plain and Kızıltepe Plain as well as forested land, brooks and creeks including valleys. A large portion of these soils are covered by alluvia carried away by the streams. A portion of more than 9 % of total land area extends over the mountainous and hilly stretches. Soils in a substantial portion of land are Brown forest soils, red and Brown soils and alluvial soils. After precipitation, the soil surface develops a shell crust having a thickness of 4 – 5 cm. However, these shell crusts are easily disintegrated into particles, getting the form of grains. Their lime contents are of a good quality.[7] The following table provides the land use status in the Province of Mardin.

Table 3 Land Use Status İn The Province Of Mardin[8]

TYPE	**LAND AREA (ha)**	**PER CENT (%)**
Irrigated Agriculture	73.266	10.077
Irrigable Agricultural Land	150.203	20,659
Post GAP Dry Agriculture	-	0
Meadows	115.447	15,878
Forest Areas	113.341	15,589
Residential Areas and Areas Not Used	274.833	37,800
GRAND TOTAL	**727.090**	**100,00**

The distribution of land capability classes in the Province is as follows.

[7]Mardin Provincial Environmental Status Report, 2011

[8] Mardin Provincial Environmental Status Report, 2011

Table 4 Land Capability Classes in the Province of Mardin

SOIL CLASSES								
I	I	I	I	I	I	I	I	I
129.342	129.342	129.342	129.342	129.342	129.342	129.342	129.342	129.342

Project Area

Land Use Map indicating soil characteristics of the facility area in further details is provided by **Annex-10.**

The soil composition and other characteristics of the facility area are provided below according to the 1/25,000 scale Land Use Map indicating soil characteristics of the facility area where the facility area is situated.

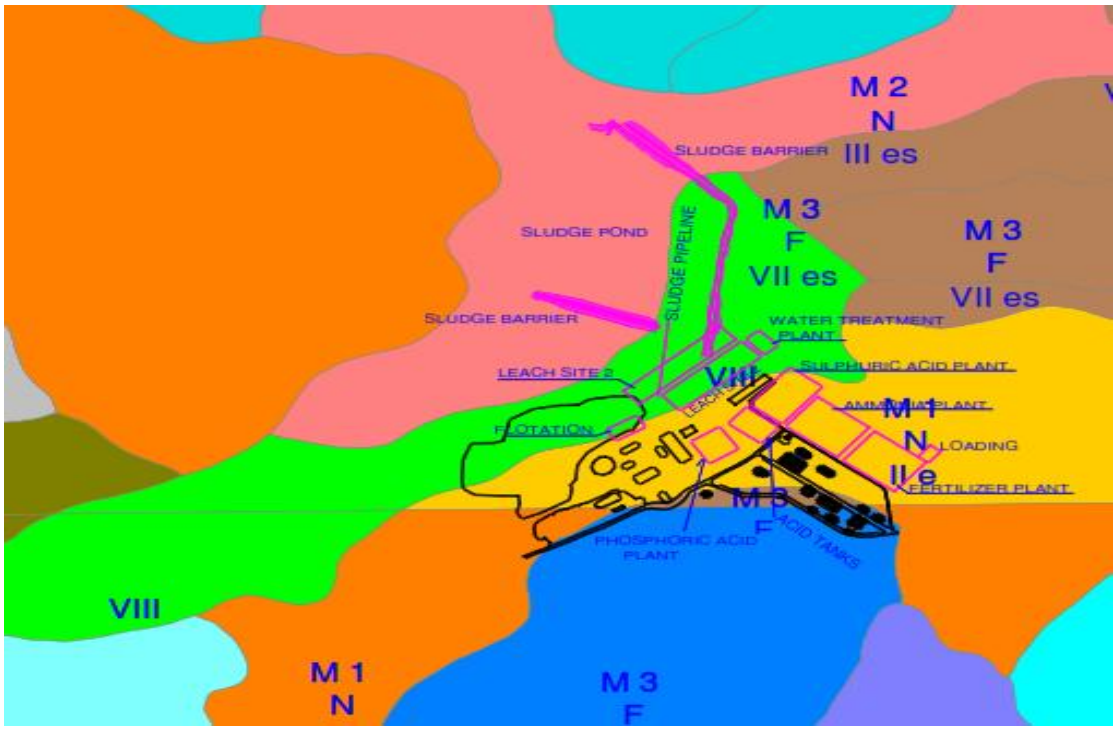


Figure 26 A Cross Section on 1/25,000 Scale Land Use Map Indicating the facility area

M 1 N II e

M **:** Brown Forest Soils

1 **:** Deep (90+ cm), Slope 0 - 2 %

N **:** Dry Agriculture

II **:** Class II Soils

e **:** Slope and erosion damages

VIII

VIII : Class VIII Soils

Brown Forest Soils

They develop on the main ingrediant which is lime rich. Their profiles are in the form of A (B) C* and have mutually stepped up transition. Since Horizon A is well developed, it is highly apparent and Brown and crumbly. It has porous or granular composition. Its pH value is alkali and sometimes neutral. The color of Horizon B varies between light Brown and red. Its pH value is same as that of Horizon B. Its composition is granular or round cornered block. There may be very low volume of ash deposit. These types of soil generally develop under expanse forest covers. Their drainage is good. They are often used as forest and grazing land. The efficiency of those stretches used in agriculture is good.

Lime Free Brown Forest Soils

They are soils having Profile A (B) C. Horizon A is well developed and has porous composition. Horizon (B) is weakly developed. It is Brown or dark Brown and of granular or round cornered block composition. Ash deposit on Horizan (B) is none or very low. Its horizon borders are transient and gradual. Lime Free Brown Forest Soils generally develop under the deciduous forest covers.

Reddish Brown Soils

These soils create combinations wih zonal and calcification processed Brown soils of arid zones very similar to themselves. In these soils which are observed in such places where annual average precipitation is 300 – 400 mm, lowness of precipitation leads to lime and gypsum deposits in their lower sections. Their annual average temperature is 12.3 ^{0} C at the places where they have developed, which is higher than the temperature at which Brown soils develop. This excessive temperature increases iron oxidization causing soil to take on a redder color tone. Their natural vegetation is composed of perennial steppe plants and thorns observed in Brown soils. Main ingredients are mostly lime rock, marl middle layered marno-limestone and ancient gravely deposits. As main ingrediants, there is rigid limestone in shallow soils as there is gravely, ancient deposits in the deeper soils. The dominant topography in these soils is lightly wavy or wavy and slope is between 6 – 20 %. It is mostly used in dry agriculture. Red Brown soils are such soils wih Horizons A (B) C. Erosion is the most important factor which restricts the depth of these soils and this is followed by the rigidness of the main ingredient.

Class II Soils

The soils in this class require a careful soil administration involving protection practices carried out in order to prevent deterioration or improve the relationships between air and water soil processing. Classifications are a few in number and easy to implement. These soils may be used for culture plants, meadows, pastures and forests. The classifications of the soils in this class are as follows:

- Light slope
- Exposure to moderate water and wind erosion or moderate adverse effects of past erosion
- Soil depth lower than what is ideal
- Somewhat unfavorable soil composition and processability
- Saltiness or saudicity varying from light to moderate levels and correctable easily but still observable
- Flood damages infrequently observed
- May be corrected with drainage but contains effects of light climatic limitations on use and administration individually or in combination

The soils in this class provide less freedom than Class I soils in terms of selection of plant species and management practices. This group of soils require proper processing methods

when they are used for protective plant growing systems, soil preservation practices, water control structures or culture plants.

Class III Soils

The soils in this class have less limitations than those in Class II. They may be used for agriculture of culture plants and as meadows, pastures and forest land at the same time. But the limitations in connection therewith affects plant selection, planting, growing, harvest time and product volumes.

There may be one or several of the following limitations in Class III land:

- Moderate slope
- Exposure to severe water or wind erosion or severe adverse effects of past erosion
- Frequent floods damaging produce
- Very slow permeability in the sub soil
- Wetness or lake formation after drainage, which continues for some time
- Shallow root zone
- Low humidity retention capacity
- Low efficiency which may not be easily corrected and
- Moderate saltiness and sodicity (alkalinity)

Most of wet or slowly permeable and almost flat soils in this class require such a product growing system which would maintain drainage and soil composition and its processability upon processing. Organic substances must be added to such soils and processing them when they are wet must be avoided in order to correct permeability. Some of Class III land soils in irrigated fields may be used to a limited extent due to higher bottom water, slow permeability and salt or sodium deposits.

Class VI Soils

The physical conditions of the soils falling in this class render practical pasture and meadow practices such as insemination, liming and contour furrows, drainage ditches, diversion structures and water distributors as well as water control. The soils in this class have permanent incorrectable limitations such as:

- Steep slope
- Serious erosion damages
- Negative effects of past erosion
- Stoniness
- Shallow root zone
- Extreme wetness and flood

- Low humidity capacity or
- Saltiness or sodicity (alkalinity)

It is not appropriate to cultivate culture plants in such soils where one or several of these limitations exist. However, they may be used for meadows, pastures and forests.

Class VII Soils

The soils which fall in this class have very severe limitations such as very step slope, erosion, soil shallowness, stoniness, wetness, saltiness or sodicity (alkalinity), which prevent cultivation of culture plants. Because their physical characteristics are not suitable for improvement, protection and control practices such as insemination, liming, contour furrows, drainage ditches, diversion structures and water distributors, they have limited means to be used for pasture and meadow improvement. Although there are cases involving tree plantation or grass seed grafting an deven some exceptional cases involving plantation of culture plants in order to take soil preservation measures or protect lower land, such cases may not be considered general characteristics for Class VII land.

Class VIII Soils

The land in this class is not suitable for cultivation of grass, trees and culture plants due to severe unpreventable limitations out of one or several limitations such as erosion, wetness, stoniness, rockiness, low humidity capacity, saltiness and sodicity (alkalinity). Excessively worn land, beaches, rocky stretches, river beds, old pits where mining operations were carried out and waste disposal areas fall in this class. This class has not been divided into any sub classes. Although they are not suitable for plant cultivation, they may be used as wild life and recreational spots.

Land Use Map is provided by **Annex-10.** Upon analysis of soil depthness of the area according to these maps, it is observed that it has very shallow, shallow, moderately deep and deep compositions and that its slopiness varies between 2 % and 20 %. The problems faced by land are in the form of slope and erosion damages and soil inadequacy. The present pattern of use for the facility area is dry agriculture.

There shall be strict adherence to the provisions of “Soil Preservation and Land Use Law”, “Pastures Law” and “Law on Aqua Products”, which was published in the Official Gazette, under the project.

Soil Analysis

Instantaneous soil samples have been taken from the Project Area in connection with the subject Project. A chemical analysis has been conducted on the soil samples taken. In the analysis made, values have been found for parameters such as mercury (Hg), arsenic (As),

copper (Cu), Cadmium (Cd), Chromium (Cr), Lead (Pb), antimony (Sb), Selenium (Se) and Zinc (Zn).

The following tables provide the limit values of the metal elements contained in soil as well as the results of the parameters analyzed.

Table 5 Limit Values of the Metal Elements Contained in Soil [9]

Metal	**Average Concentration in Soil (mg/kg)**	**Threshold Limit Value (mg/kg)**	**Anomaly Values Not Having Natural Origin (mg/kg)**
Cr	50-200	75	3500
Cu	15-40	75	250
Zn	50-100	200	900
As	0,1-15	15	-
Se	0,1-3	1	120
Cd	0,01-2	1	-
Hg	0,01-5	0,5	-
Pb	15-30	100	1200

Table 6 Soil Sample (Chemical Analysis) Results

Parameter	**Unit**	**Results of the Chemical Analysis**
Cr	mg/kg	64
Cu	mg/kg	32,1
Zn	mg/kg	217

9 Threshold Limit Values for Heavy Metals in Soils in the Function of Spatial and Temporal Variation of Geochemical Factors, P.SIPOS and T.PÓKA, Laboratory for Geochemical Research, Hungarian Academy of Sciences, H-1112 Budapest, Budaörsi út 45., Hungary

As	mg/kg	3,75
Se	mg/kg	<1,25
Cd	mg/kg	8
Hg	mg/kg	4,75
Pb	mg/kg	277,5
Pb	mg/kg k.ton	17,5

The soil sample chemical analysis is provided by **Annex-11**.

5.1.4. Land Asset and Usage

There are three types of land around the Project area. These are forest land, pasture land and personal lands. The personal lansd are owned by ETİ BAKIR A.Ş. for the forest land, there is an existing permission (**Refer to Annex-12**). This permission is in renovation process. The new Forest Area Permission will be delivered as soon as possible by authorized personnel of Ministry of Forestry and Water Affairs. For pasture lands, the land assignement changing process was conducted. The assignement changing is in approval phase. It is predicted that the permission letter will be taken as soon as possible.

5.1.5. Water Resources

The water resources in the Province of Mardin are in the form of ground water and springs. Use is made of springs, ground water and surface water for the purpose of supplying water for drinking and service water as well as for irrigation to a partial extent.

Streams

Çağ Çağ Suyu: The Brook of Çağ Çağ is the most important stream in the Province. The Brook of Çağ Çağ is located in the territories of the District of Nusaybin and comprises two offshots called Karasu and Beyazsu. The minimum and maximum capacity of the Brook of Çağ Çağ are assumed at 8 m3/s and 12 m3/s.

Gümüş Suyu: It is used as irrigation water and this stream which originates at the Village of Erdem west of the Province of Mardin crosses into the State of Syria via South of the Village of Akdoğan.

Habur Çayı: This stream, which originates from the Village of Suçi in the District of Savur in the Province of Mardin, is used for supplies of drinking water, service water and irrigation water and constitutes the life blood of the District of Savur.

Buğur Çayı: It originates from a spring near the Village of Buğur in the District of Derik in the Province of Mardin. This stream is used as irrigation water.

Reşan Çayı (Karasu): It is situated between the Village of Yücebağ in the District of Mazıdağı in the Province of Mardin and Province of Diyarbakır and it is a beneficial stream on which high capacity and quality trout farming is carried out. [10]

Lakes, ponds and reservoirs

There are no natural lakes in the Province of Mardin but there are 1 dam and 3 ponds (manmade lakes) in the Province. They are: Ponds of Yıldız and Şerif Baba under responsibility of DSİ (State Hydraulic Works) (total net irrigation land area 312 ha) and Künreş Pond in the District of Derik under responsibility of Çınar Union for Provision of Services to Villages. Çağ Çağ Dam is the first dam in the Province and was put into service in 1968. Çağ Çağ Power Plant comprises 3 units. Each unit has an output of 4.8 MW and the installed output of the plant is 14.4 MW. Although its average annual generation was initially 42 GW/h, it may decline depending on the actual volume of water supply.

Mazıdağı District

The southwest and northwest parts of the district are poor in terms of ground and surface water resources. This situation entirely relates to lithology. The region's rare resources are at the convergence point of the Upper Cretaceous marls and Eocene Age limestone units near the Village of Kocakent in the northeast.

There are no streams in the areas covered by the Upper Cretaceous units in the region and at the same time, no slightest signs of ground water could be encountered in deep borings carried out there. Supply of drinking water is the people's biggest problems on a district wide basis and drinking water is supplied from the artificial lakes in the pits at the village, which are called "Ponds", filled by rain and snow water in winter.

Apart from these ponds being non-hygienic, such ponds entirely dry up in summer months generally and this adds up to major problems in the region as local people are deprived of their sole source of supply.

Genellikle güneybatı- kuzey doğu yönünde uzanan kuru dereler detritik drenaj gösterirler. The dry brooks generally extending in the southwest – Northeast direction exhibit detritic drainage

[10] Mardin Provincial Environmental Status Report, 2011.

characteristics. They are principally: Kumlu Dere, Çeme Peşan Deresi, Kef Deresi, Tevkel Deresi, Avzink and Curum Kevaşa Deresi.

Karaçay (Çeme Reşan), which is the only stream of the District of Mazıdağı, originates northwest of the district and supplemented by some springs. After joining Göksu, it then pours into the River of Tigris. It is endeavored to meet water requirements of many villages, particularly the central district, from this creek. However, its parts located in the east and northeast of the district are richer than the other parts in terms of ground and surface water resources. Therefore, garden agriculture is carried out at the villages in such parts. These villages are: Raşan, Duraklı, Ömürlü, Gürgöze and Bilge.

It is endeavored to meet water requirements of the district center with such volumes of water transported from Borange and Karaçay. However, because these resources fall short of meeting the water requirements of the district, Works are under way for the purpose of meeting the water requirements of the district from Hetari and Norte Springs located in the east of the district center; because the water supply means in the district are inadequate, district people bore wells for the purpose of benefitting ground water. Water is limy depending on the local natural composition.

Although agricultural and livestock are local people's basic means of livelihood in the District of Mazıdağı, inadequate levels of water supply have also adversely affected agriculture and livestock. Agriculture is carried out by means of dry agriculture system. Scarcity of water supply has also limited the presence of plant species. Some brooks and springs which are dependent on rains and snow waters available in winter and spring start drying up along with increased temperatures.[11]

[11]http://www.mazidagi.gov.tr/default_B0.aspx?content=1003

5.1.6. Climatology

General Climatic Characteristics of the Location Where the Activity is To Be Realized

The climate in the Province of Mardin exhibits characteristics of a transient climate between the Continental Climate and Mediterranean Climate. Summers are hot as winters are cold. The number of snowing days is no more than 10 days as the number of days when temperature is below zero is as low as 60 days. Temperature is above 30°C for almost 100 days a year.[12]

The characteristics of the continental climate prevail on a province wide basis. Winter months are cold. Spring months are dry because they are under the influence of the desert climate from the South. The highest temperature measured in the Province is 42.5°C (July 31, 2000); besides, the province has had the temperature record in Turkey (48.8 ^{0} C in Mardin, Kızıltepe). The lowest temperature measured in the Province is -14 ^{0} C (February 22, 1985); in addition, the region is under the influence of dust drift from the deserts particularly in spring and summer.

The characteristics of the Mediterranean Climate are also seen in the Districts of Derik, Nusaybin and Savur. Average highest temperature of 35.3°C was observed in July as the average lowest temperature of 0.7°C was recorded in January. [13]

The high mountains in the North have major impact on the climate in Mardin; the high pressure zone developing in the winter period causes winter months to be colder. Summers are very hot in the North of Mardin as the typical characteristics of the continental climate are observed there because, on the one hand, it is under the influence of the desert climate in the South and on the other hand, the high mountains in the North prevent cool air masses from entering the region. However, cultivation of produce such as cotton, hazelnuts and olives in the Districts of Derik, Nusaybin and Savur indicates that the characteristics of micro climate prevail in the region.[14]

The Part, Meteorological and Climatic Characteristics, has been prepared by making use of Mardin Meteorological Station Observation Records Spanning Many Years (1970 – 2012), which have been obtained from the State Meteorological General Directorate, and Approved Meteorological Data are provided in an annex hereto **(Refer to Annex-13).**

[12] http://www.cografya.gen.tr/tr/mardin/iklim.html

[13] http://tr.wikipedia.org/wiki/Mardin_(il)

[14] http://www.mardin.gov.tr/web/mardinvaliligi/detay.asp?id=124&kategori=MARD%DDN

Temperature Distribution of the Location Where the Activity is To Be Realized

Annual average temperature is 16.2°C according to Mardin Meteorological Station Observation Records between 1970 and 2012. Highest temperature was measured at 42.5 °C in July 2000 as the lowest temperature was measured at -14°C in February 1985.

Table 7 Mardin Meteorological Station Temperature Values Between 1970 and 2012

Months	January	February	March	April	May	June	Temmuz	August	September	Oct.	Nov.	Dec.	ANNUAL
Average Temperature (°C)	3,1	4,1	8,2	13,7	19,7	25,8	30,1	29,6	25,3	18,5	10,7	5,2	**16,2**
Maximum Temperature °C)	19,4	18,4	27,5	33,6	35,4	40	42,5	41,1	38,8	35,6	25,5	24,1	**42,5**
Minimum Temperature (°C)	-11	-14	-11,7	-4,5	2,6	5	12,7	14,1	8	1	-5	-11,9	**-14,0**

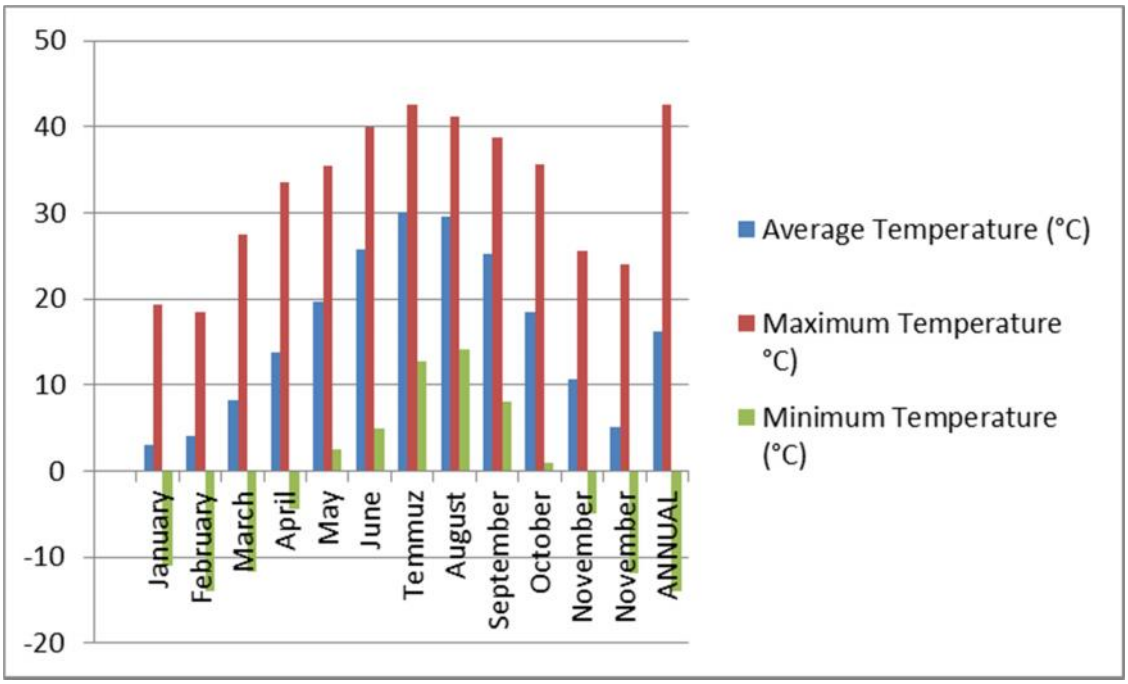


Figure 27 Mardin Meteorological Station Temperature Values Between 1970 and 2012

Precipitation Distribution of the Location Where the Activity is To Be Realized

Annual average total precipitation volume is 52.92 mm according to Mardin Meteorological Station Observation Records Spanning Many Years (1970 – 2012). Maximum daily precipitation volume was measured at 145.9 mm in February.

Table 8 Mardin Meteorological Station Precipitation Values Between 1970 - 2012

MONTHS	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	ANN.
Total Precipitation Average (mm)	101,6	108,6	94,9	79	38,4	5,5	1,5	0,3	1,9	32,8	68,3	102,2	**52,9**
Daily Maximum Precipitation (mm)	140	145,9	65,4	112,2	57	35,8	23,8	5,5	10,8	81,9	83	94	**145,9**

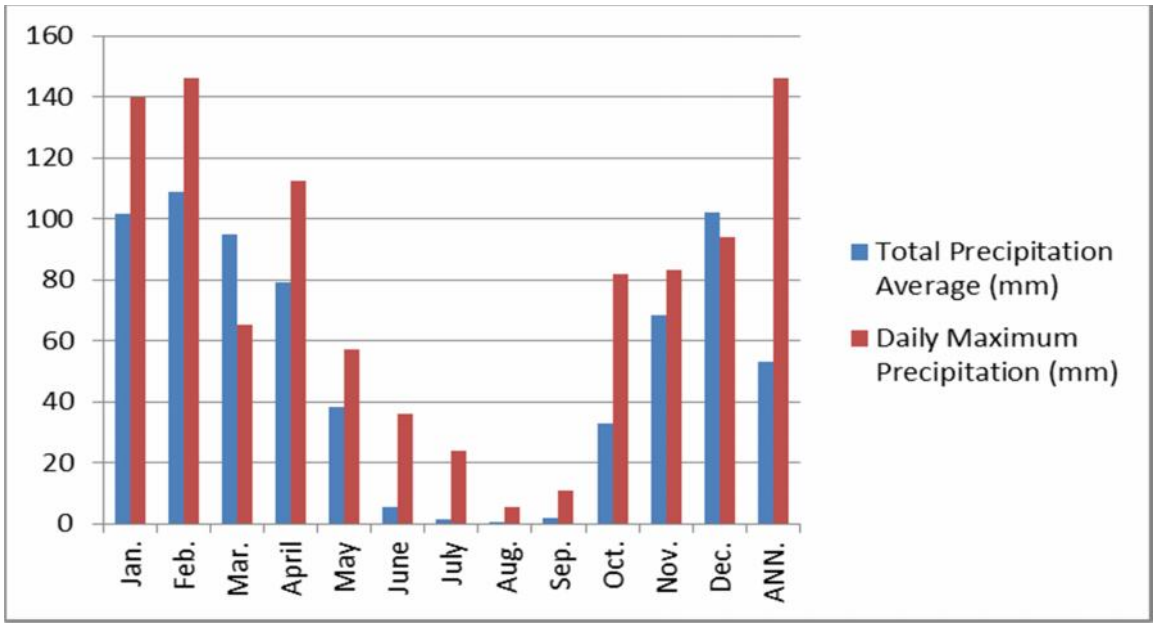


Figure 28 Precipitation Values Between 1970 - 2012

Humidity Distribution of the Location Where the Activity is To Be Realized

Annual average relative humidity is 47.4 % according to Mardin Meteorological Station observation records between 1970 and 2012.

Table 9 Mardin Meteorological Station Relative Humidity Values between 1970 and 2012

Months	**Jan.**	**Feb.**	**Mar.**	**April**	**May**	**June**	**July**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**ANN.**
Avarage Nem %)	64,5	63,6	57,8	54,4	43,1	32,3	27,7	28,4	32,6	45,1	55	64,2	**47,4**
Minimum Nem %)	5	3	2	4	1	0	2	1	2	2	1	6	**2,4**

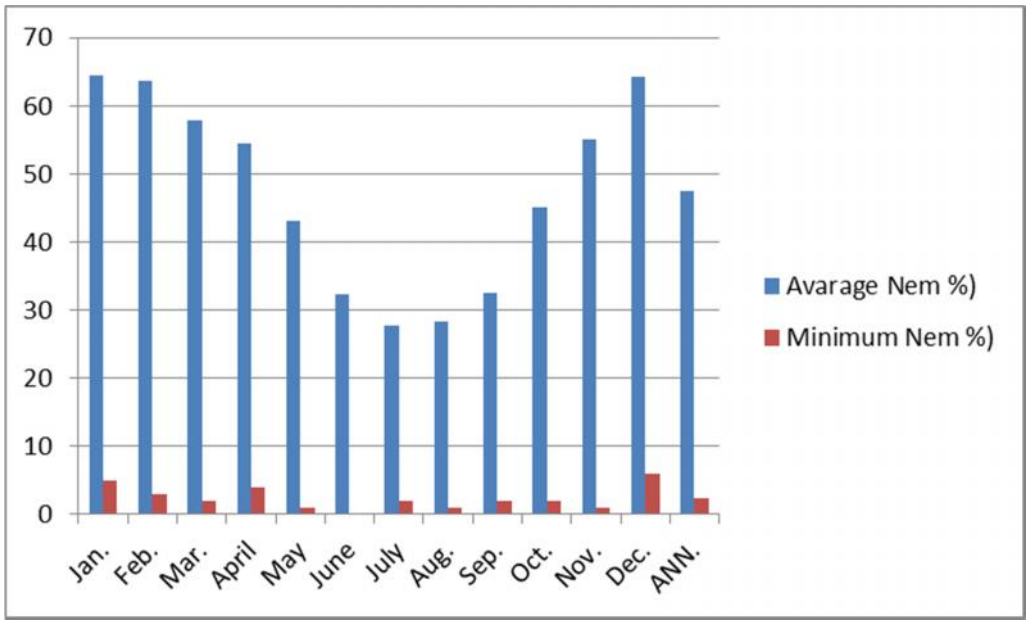


Figure 29 Humidity Values between 1970 and 2012

Evaporation Condition of the Location Where the Activity is To Be Realized

Annual Average Open Surface Evaporation is 249.26 mm according to Mardin Meteorological Station Observation Records between 1970 and 2012. Maximum Daily Open Surface Evaporation was observed at 31.2 mm in July.

Table 10 Mardin Meteorological Station Evaporation Values Between 1970 and 2012

Aylar	**Jan.**	**Feb.**	**Mar.**	**April**	**May**	**June**	**July**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**	**ANN.**
Avarage open surface evapoeartion (mm)				122,3	234,1	387	478,9	453,5	349,8	198,4	19,1	0,2	**249,26**
Maximum open surface evapoeartion (mm)				18	17,4	30	31,2	30,3	28	16,8	12	1,5	**31,2**

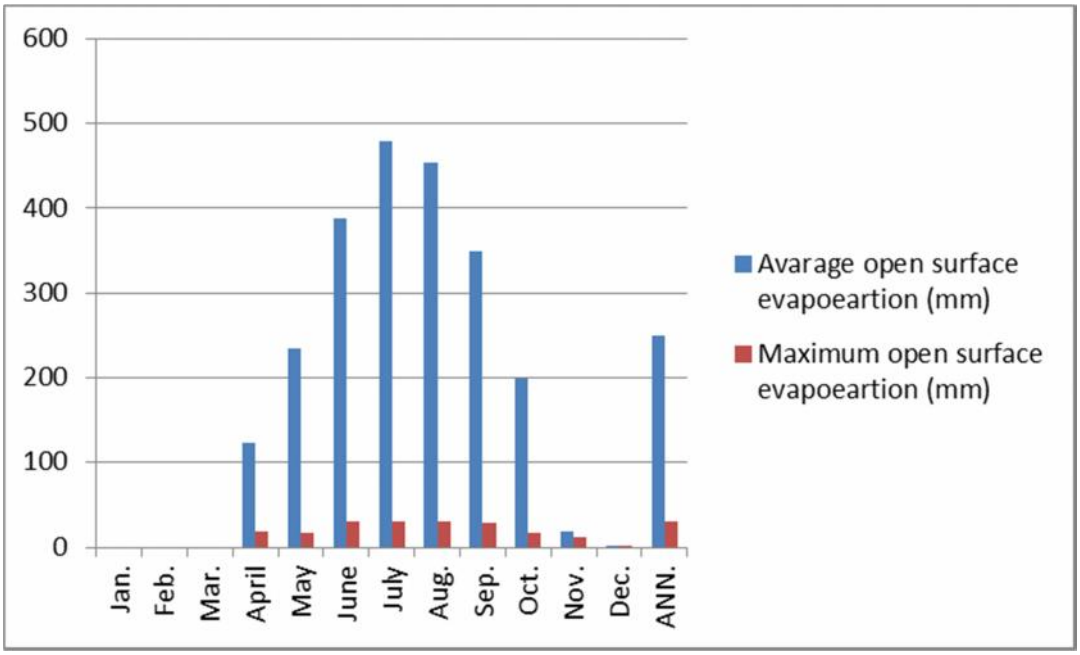


Figure 30 Evaporation Values Between 1970 and 2012

Distribution of Counted Days of the Location Where the Activity is To Be Realized

Annual average number of days when precipitation was 0.1 mm and more, Annual average number of snowy days, Annual average number of snow covered days, Annual average number of foggy days, Annual average number of hailing days and Annual average number of frosty days were measured at 6.24, 12.4, 14.4, 21.1, 3.7 and 2.3, respectively, according to Mardin Meteorological Station Observation Records between 1970 and 2012.

Table 11 Rainy, Foggy, Hailing, Frosty and Thunderstorming Days as per Mardin Meteorological Station Between 1970 and 2012

MONTHS	January	February	March	April	May	June	Temmuz	August	September	October	November	December	Annual
No of Snowing Days	4,6	3,8	1,4	0,1		0					0,5	2	**12,4**
No of Days with Snow Cover	5,9	5,1	0,8								0,3	2,3	**14,4**
Average number of foggy days	4,7	4,3	3,3	1,5	0,4				0,1	0,4	2,2	4,2	**21,1**
Average number of hailing days	0,2	0,6	1	0,9	0,4	0,1			0	0,1	0,3	0,1	**3,7**
Average number of frosty days	0,9	0,3	0,1								0,1	0,9	**2,3**
Average number of days with thunderstorms	0,2	0,5	1,7	3,1	2,9	0,9	0,3	0,2	0,4	1,4	0,9	0,1	**12,6**

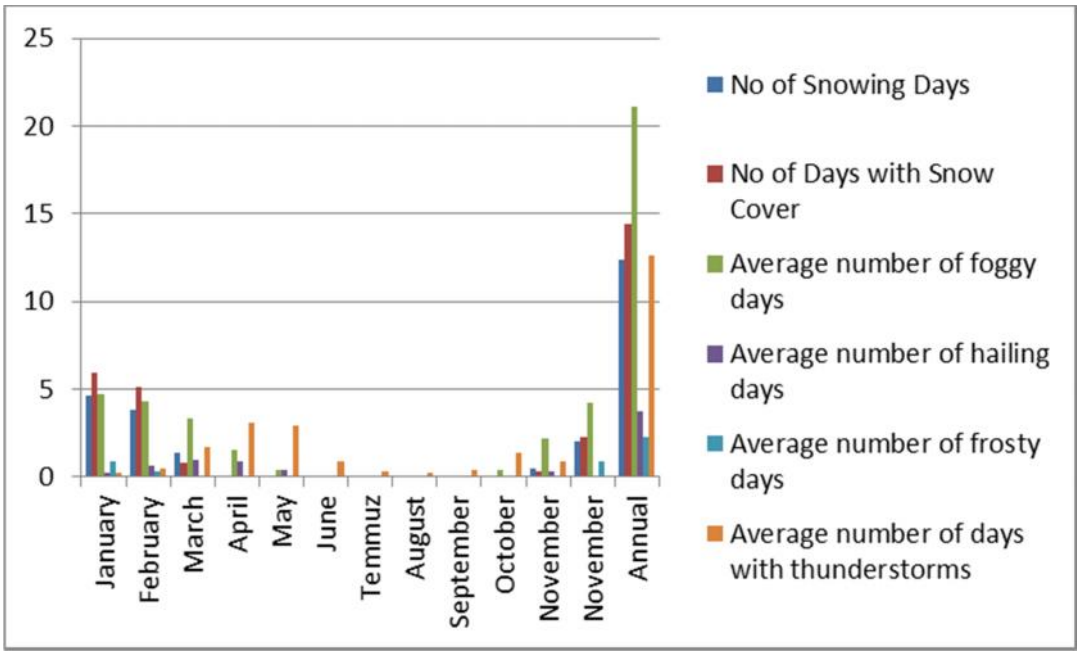


Figure 31 Rainy, Foggy, Hailing, Frosty and Thunderstorming Days

Maximum Snow Cover Thickness

Total annual maximum snow cover thickness was measured at 92 cm in February according to Mardin Meteorological Station Observation Records between 1970 and 2012.

Table 12 Maximum Snow Thickness Values as per Mardin Meteorological Station Between 1970 and 2012

Months	**January**	**February**	**March**	**April**	**May**	**June**	**Temmuz**	**August**	**September**	**October**	**November**	**November**	**ANNUAL**
Maximum Snow Cover Thickness (cm)	55	92	36								20	48	92

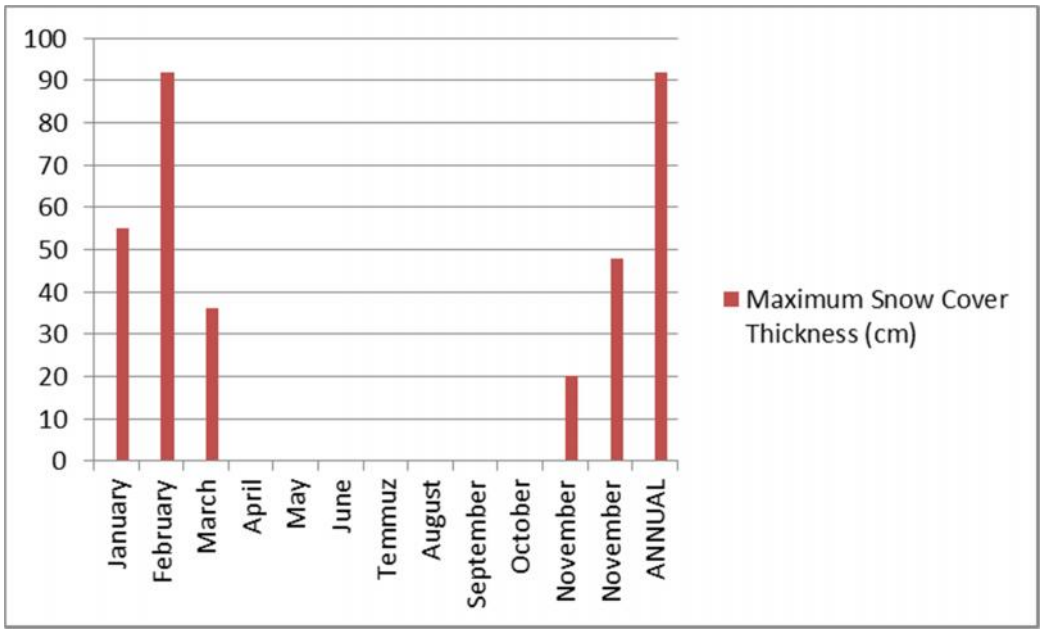


Figure 32 Maximum Snow Thickness Values

Wind Distribution and Annual, Seasonal and Monthly Wind Directions of the Location Where the Activity is To Be Realized

The total number of wind blowings is provided by the following table according to Mardin Meteorological Station Observation Records between 1970 and 2012.

Table 13 Total Numbers of Blowings As Per Mardin Meteorological Station Between 1970 and 2012

Sum of Wind Blowing Number	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	**Annual Total**
N direction	3326	2525	2585	2012	2769	3294	3663	3166	3118	3282	3066	3308	**36114**
NNE direction	7360	6472	6025	4326	6300	6694	6223	4980	5125	6979	7500	6589	**74573**
NE direction	1095	841	964	846	1345	1016	918	884	662	942	1225	1097	11835
ENE direction	1718	1297	1382	1260	1411	696	664	622	462	735	1141	1576	12964
E direction	1830	1510	1512	1450	961	266	344	361	389	1130	1423	1973	13149
ESE direction	4490	3778	3252	3133	1750	690	815	1032	1041	2476	3445	5084	30986

SE direction	2006	1701	1576	1674	959	427	560	634	765	1300	1501	1809	14912
SSE direction	2598	2767	3459	3415	2156	1223	1860	2134	2090	3089	3093	3005	30889
S direction	526	742	1015	1401	1176	744	903	1285	1039	1154	796	561	11342
SSW direction	1209	1910	2969	3972	4623	4879	5549	6227	5829	3717	2188	1292	**44364**
SW direction	260	367	574	923	1108	1324	1555	1806	1962	989	498	289	11655
WSW direction	289	500	836	1120	1372	1740	1575	1643	1635	978	483	256	12427
W direction	88	101	177	319	380	350	422	415	359	283	176	72	3142
WNW direction	246	215	532	582	676	700	685	796	781	558	338	235	6344
NW direction	822	545	676	516	742	782	870	996	1076	698	514	593	8830
NNW direction	3052	3050	3517	3011	3464	5301	5287	4763	4564	3497	3329	3262	**46097**

Degree 1 wind direction is (NNE) North – North East, Degree 2 wind direction is (NNW) North – North East, Degree 3 wind direction is (SSW) South – South West, Degree 4 wind direction is (N) North according to Mardin Meteorological Station Observation Records between 1970 and 2012. Annual wind diagram according to the numbers of blowings is provided below.

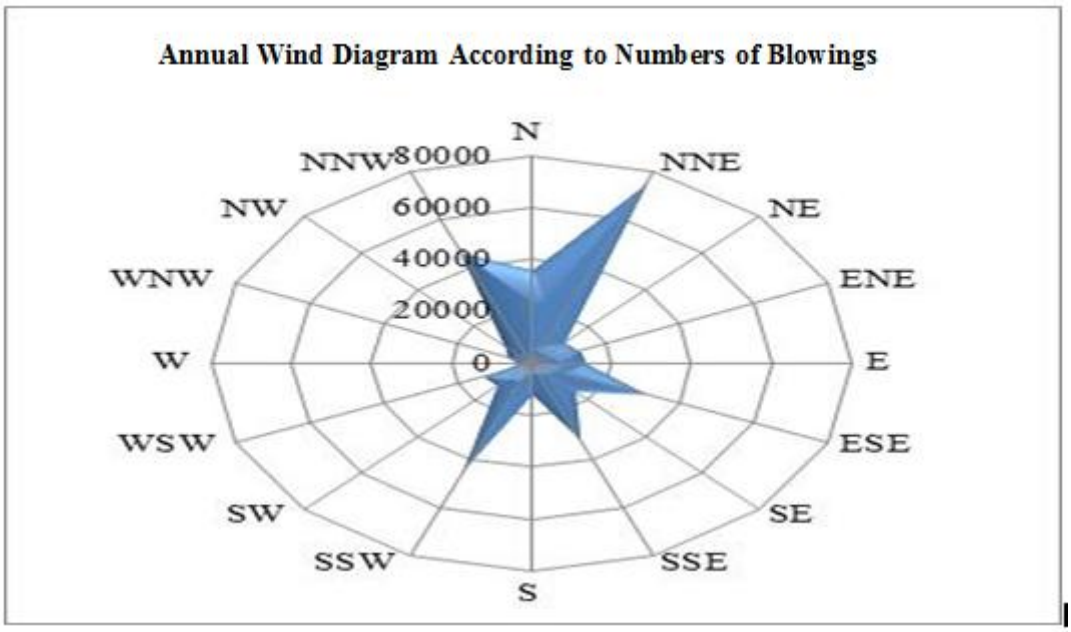


Figure 33 Annual Wind Diagram According to Numbers of Blowings

The numbers of blowings have been calculated on a seasonal basis according to Mardin Meteorological Station Observation Records between 1970 and 2012 and are provided by the following table.

Table 14 Total Numbers of Seasonal Blowings Between 1970 and 2012

Total Numbers of Wind Direction	WINTER	SPRING	SUMMER	AUTUMN
N direction	9159	7366	10123	9466
NNE direction	20421	16651	17897	19604
NE direction	3033	3155	2818	2829
ENE direction	4591	4053	1982	2338
E direction	5313	3923	971	2942
ESE direction	13352	8135	2537	6962
SE direction	5516	4209	1621	3566
SSE direction	8370	9030	5217	8272
S direction	1829	3592	2932	2989
SSW direction	4411	11564	16655	11734
SW direction	916	2605	4685	3449
WSW direction	1045	3328	4958	3096
W direction	261	876	1187	818
WNW direction	696	1790	2181	1677
NW direction	1960	1934	2648	2288

NNW direction	9364	9992	15351	11390

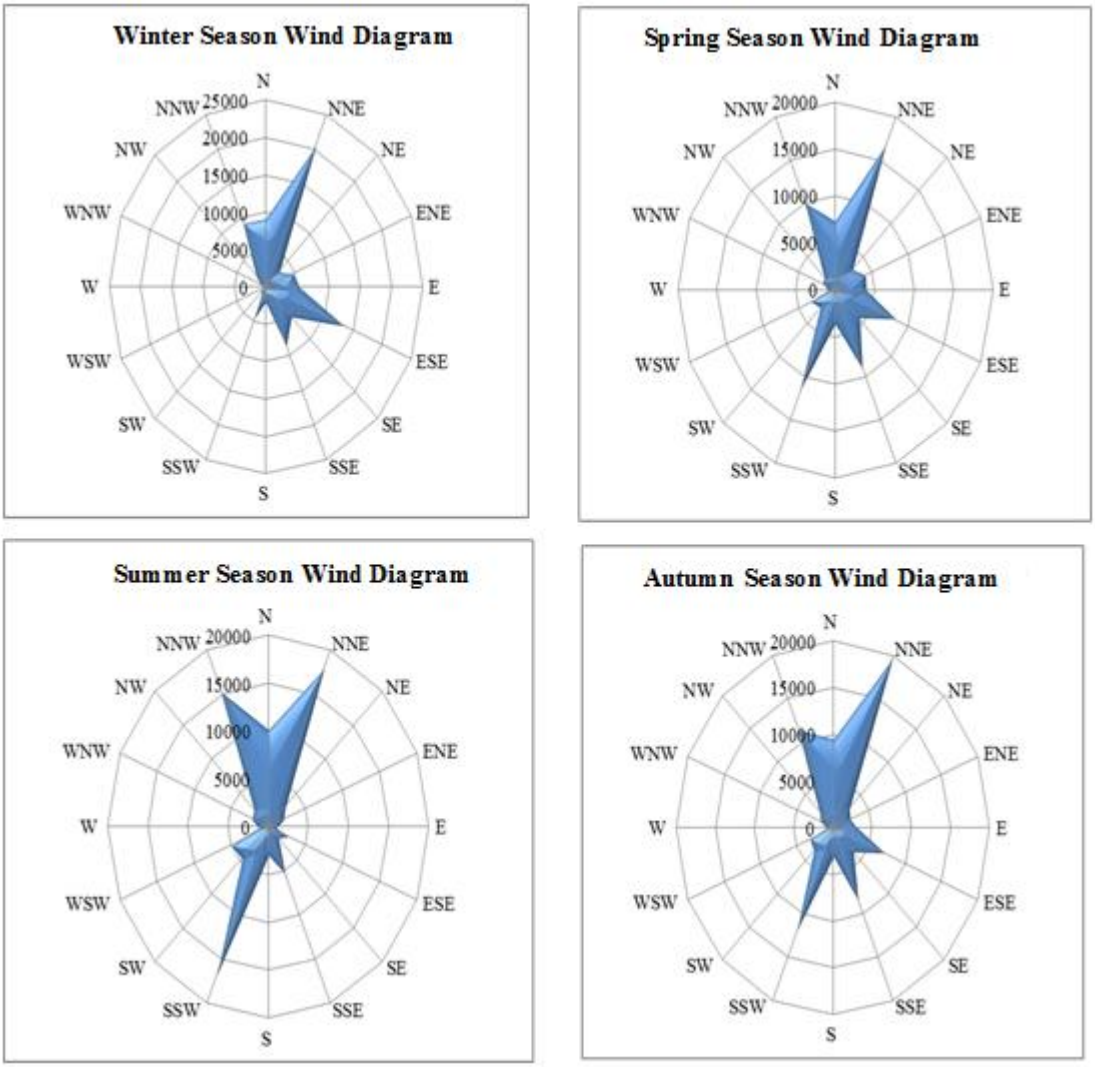
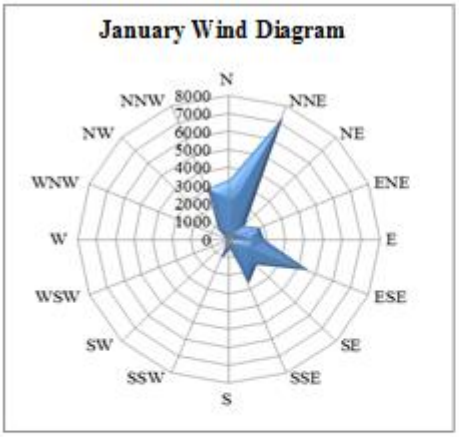
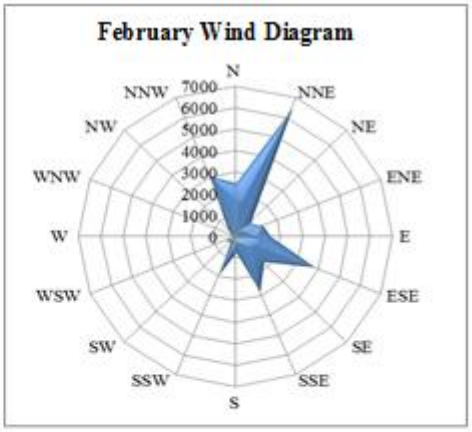
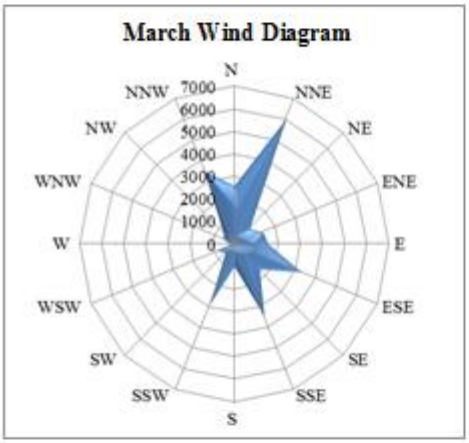
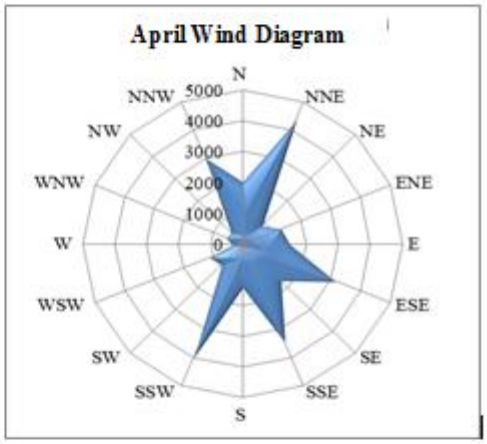


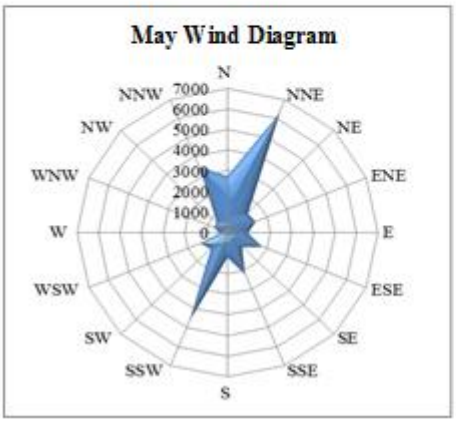
Figure 34 Seasonal Wind Diagram According to Number of Wind Blowing

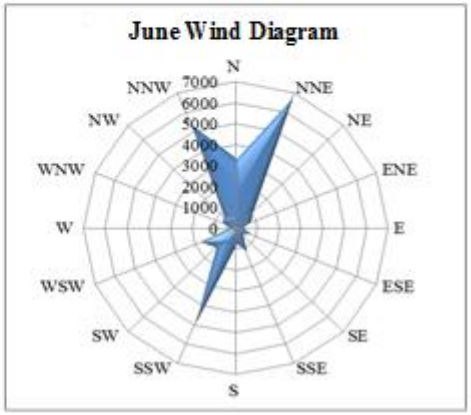

January Wind Diagram
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
8000
7000
6000
5000
4000
3000
2000
1000
0


February Wind Diagram
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
7000
6000
5000
4000
3000
2000
1000
0


March Wind Diagram
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
7000
6000
5000
4000
3000
2000
1000
0


April Wind Diagram
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
5000
4000
3000
2000
1000
0


May Wind Diagram
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
7000
6000
5000
4000
3000
2000
1000
0


June Wind Diagram
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
7000
6000
5000
4000
3000
2000
1000
0

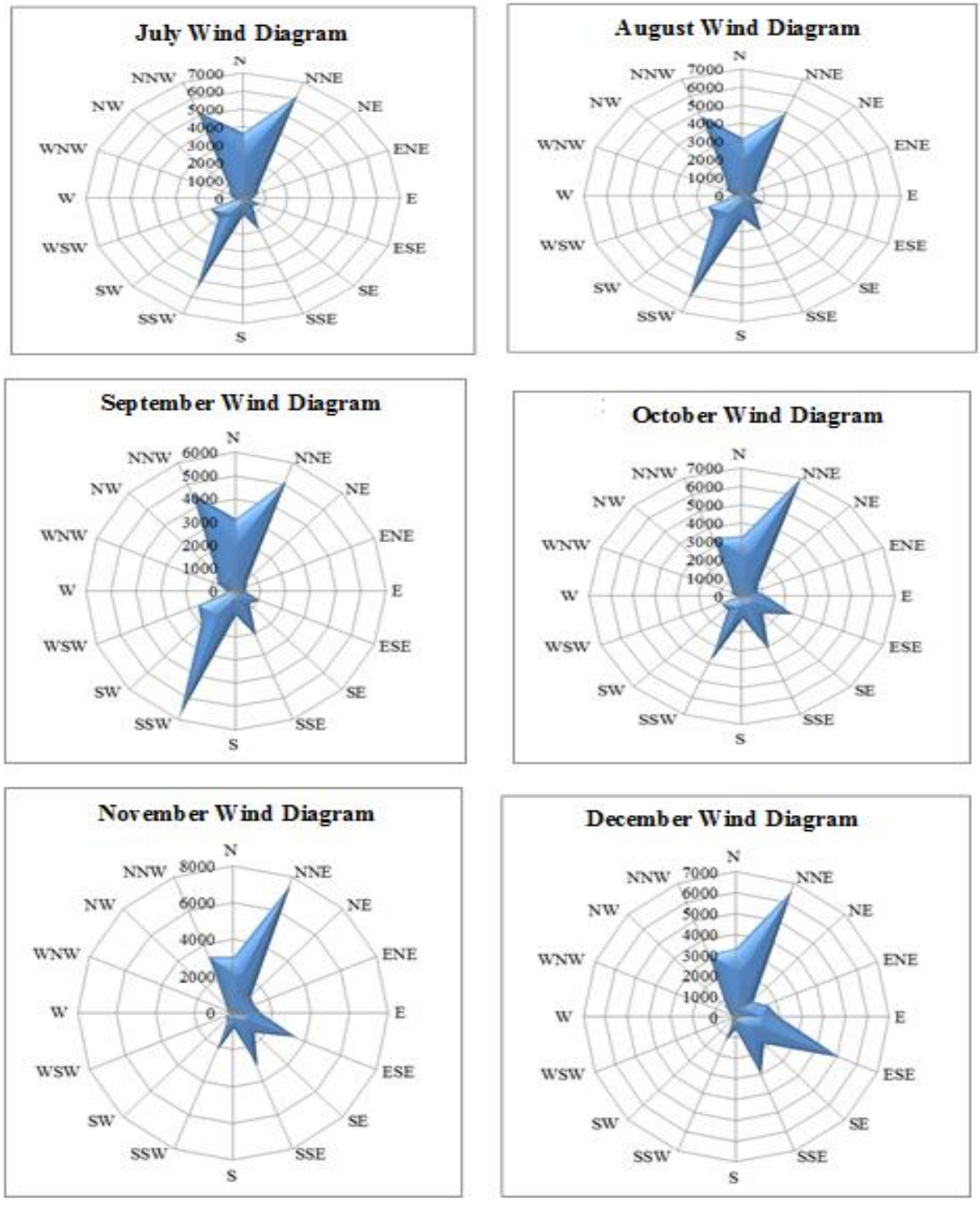


Figure 35 Monthly Wind Diagram According to Number of Wind Blowing

Wind Speed Distribution of the Location Where the Activity is To Be Realized

Wind blowing speeds are provided by the following tabe according to Mardin Meteorological Station Observation Records between 1970 and 2012.

Table 15 Average Wind Speeds By Direction Between 1970 and 2012

Avarage Speed of Wind Blowing (m/s)	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	**Average Wind Speed**
N direction	4,5	4,7	4,3	3,8	4,1	4,7	4,4	4	3,8	3,7	3,9	4,4	4,2
NNE direction	4,4	4,5	4,4	4	4,4	4,7	4,3	4	4	4,1	4,1	4,3	4,3
NE direction	3,1	3,7	3,8	3,7	4,1	4	3,7	3,3	3	3,2	3	3,1	3,5
ENE direction	2,9	2,9	2,9	3,1	3,2	2,9	2,5	2,4	2,1	2,6	2,6	2,7	2,7
E direction	3,2	3,5	3,6	3,4	3,1	2,7	2,1	1,9	1,8	2,5	2,7	3	2,8
ESE direction	3,4	3,6	3,4	3,4	2,8	2,4	2,3	2,2	2,1	2,6	2,8	3,2	2,9
SE direction	3,4	3,7	3,5	3,4	2,8	2,9	2,4	2,2	2,4	2,9	3,1	3,1	3,0
SSE direction	2,8	3,1	3,1	3	2,8	2,7	2,6	2,6	2,6	2,7	2,7	2,7	2,8
S direction	2,1	2,7	2,9	3	3,1	3,1	2,9	2,8	2,7	2,6	2,2	2	2,7
SSW direction	2,1	2,7	3	3,2	3,3	3,6	3,3	3,3	3,3	2,8	2,3	2,1	2,9
SW direction	1,7	2,2	2,2	2,7	2,9	3,4	3	2,8	2,7	2,1	1,9	1,6	2,4
WSW direction	1,5	1,9	2,2	2,3	2,5	2,8	2,6	2,3	2,2	1,9	1,7	1,5	2,1
W direction	1,5	1,8	1,9	2,1	2,3	2,5	2,4	1,7	1,7	1,6	1,5	1,7	1,9
WNW direction	1,8	2,2	2,1	1,9	2,1	2,3	2,1	1,9	1,9	1,8	1,7	2	2,0
NW direction	2,7	2,7	2,7	2,2	2,6	2,8	2,5	2,3	2,2	2	2	2,9	2,5
NNW direction	3,6	3,5	3,4	2,9	3	3,4	3,2	3	2,9	2,8	3	3,6	3,2

Wind diagram of average values spanning many years is provided below according to the blowing speeds. Accordingly, the directions with highest blowing speeds are (NNE, N, NE) North – North East, North, North East and (NNW) North-North West.

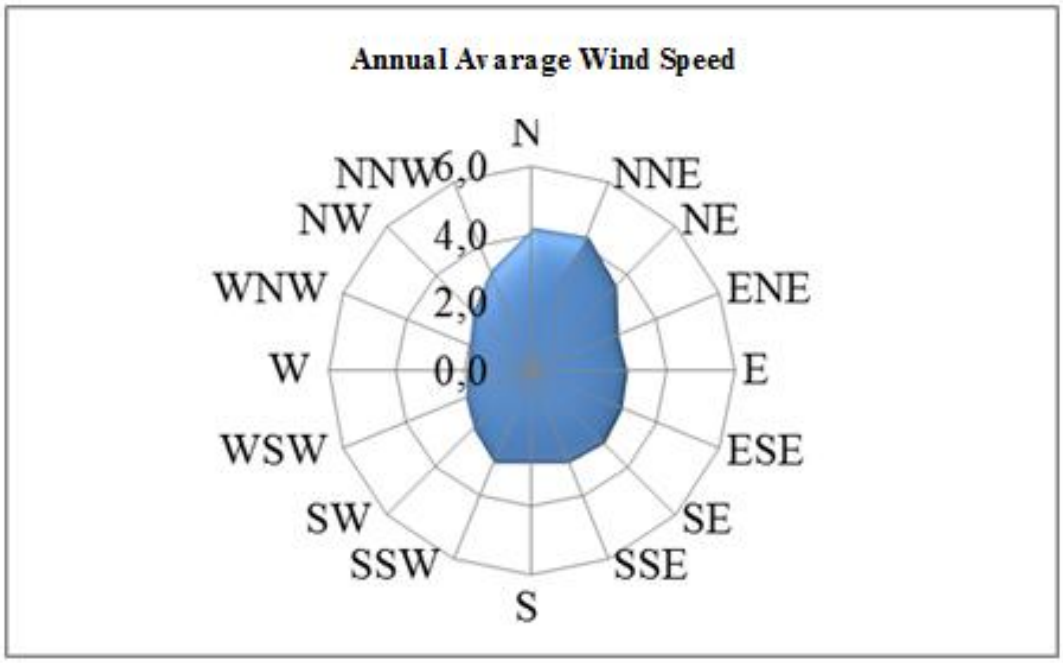
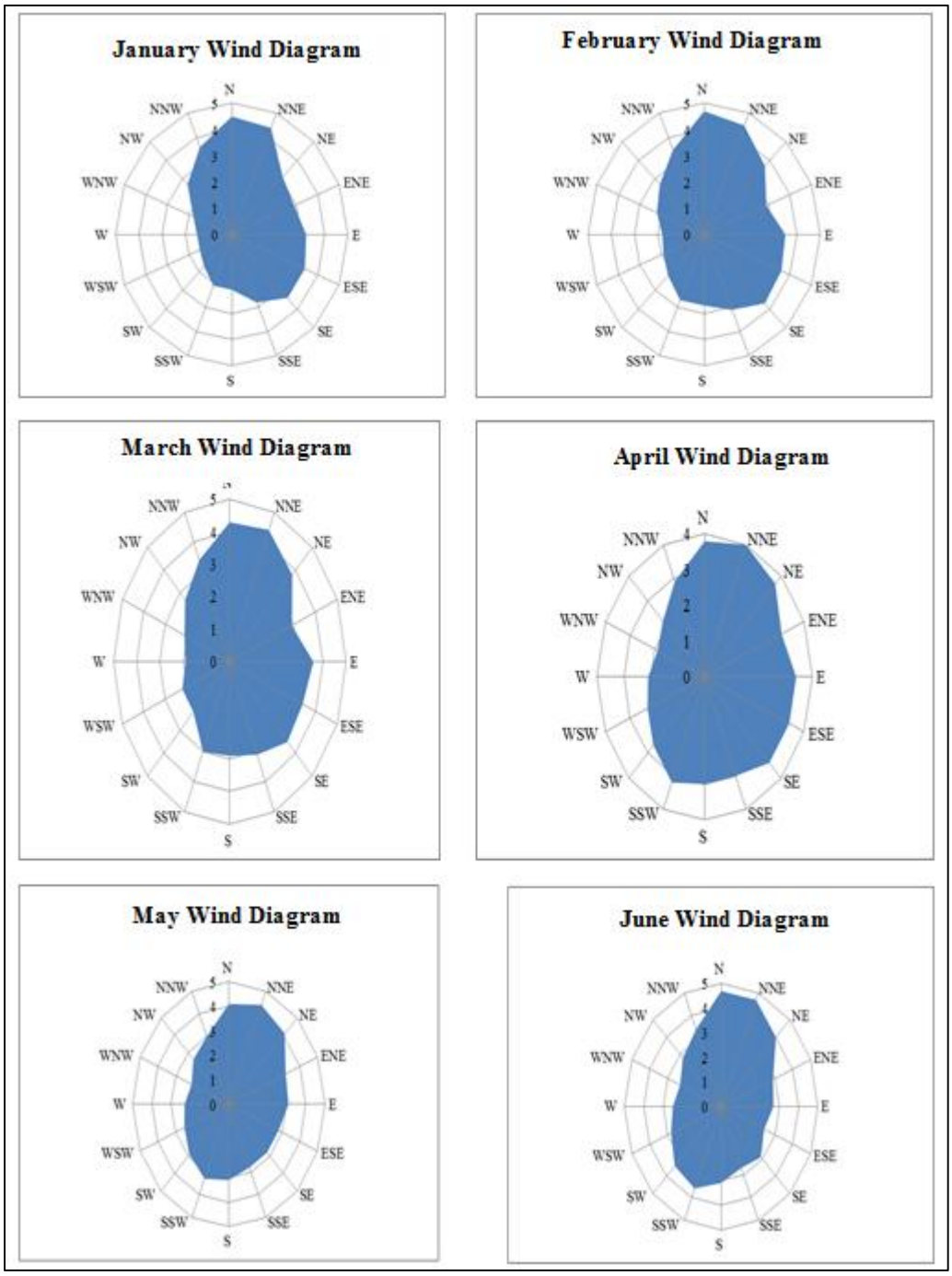


Figure 36 Annual Avarage Wind Speed


January Wind Diagram
February Wind Diagram
March Wind Diagram
April Wind Diagram
May Wind Diagram
June Wind Diagram
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW

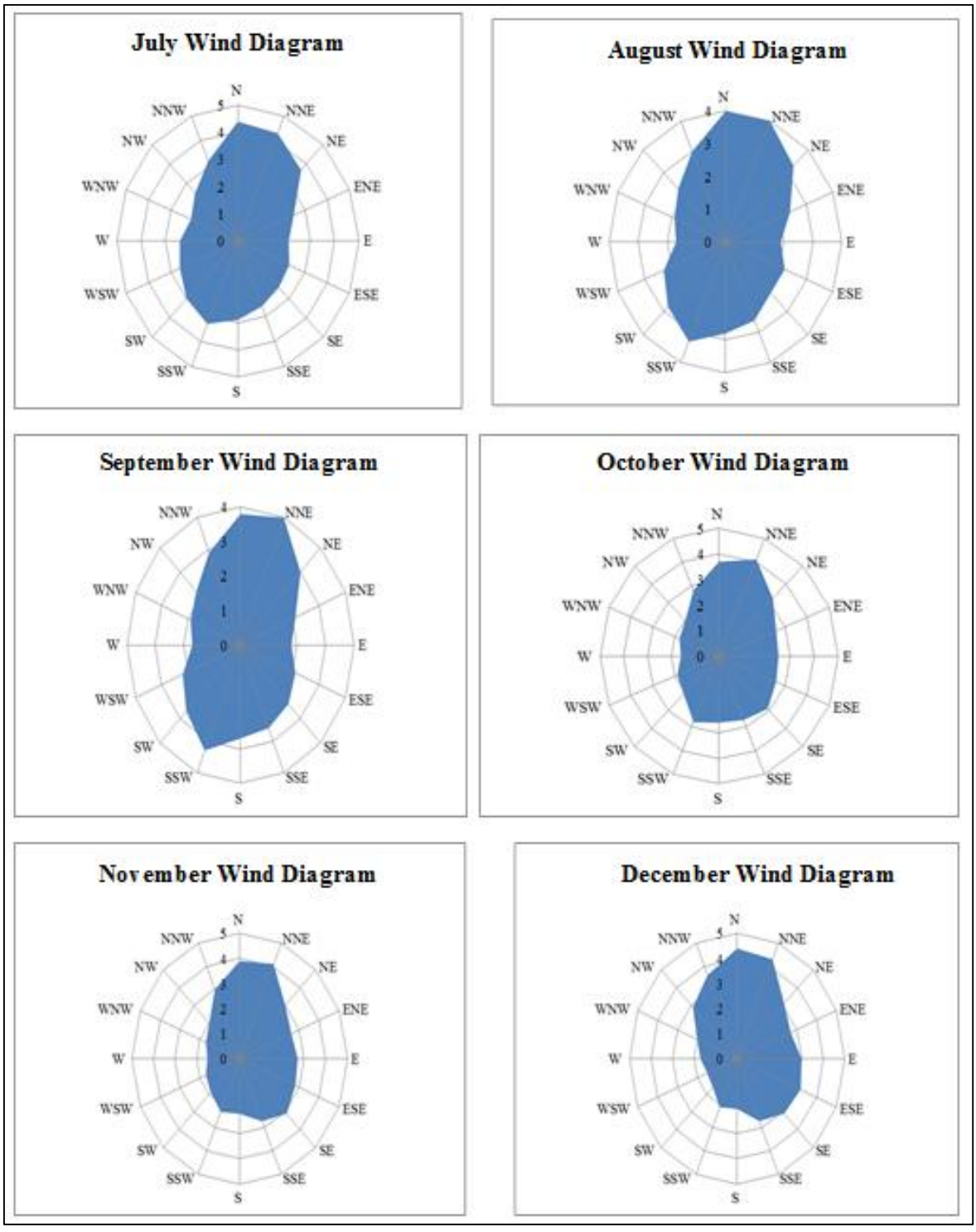


Figure 37 Monthly Wind Speed Diagrams

Average Wind Speed

Annual average wind speed is 4 m/s according to Mardin Meteorological Station Observation Records between 1970 and 2012.

Table 16 Monthly Average Wind Speeds Between 1970 and 2012

MONTHS	January	February	March	April	May	June	July	August	September	October	November	November	Ann. Ava.
Avarage Wind Speed(m/s)	4,4	4,5	4,2	3,9	4	4,2	3,9	3,6	3,5	3,6	3,8	4,2	**4,0**

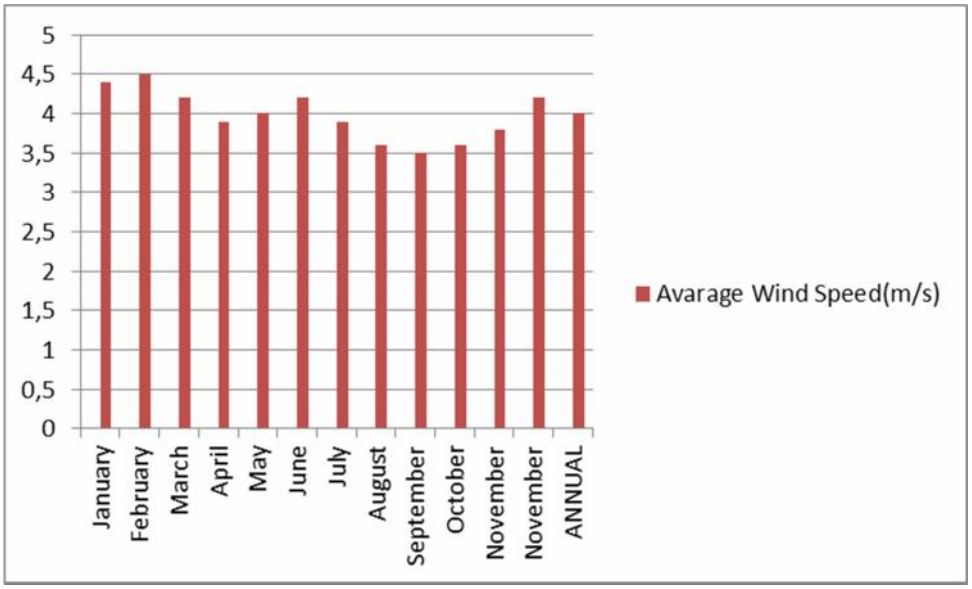


Figure 38 Avarage Wind Speed

Direction and Speed of the Fastest Blowing Wind

Table 17 Maximum Wind Speed and Direction

Fastest Blowing Wind	**MONTHS**												**ANNUAL**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	
Direction	E	SE	NNW	SE	ENE	NNE	NNW	ESE	NNW	S	ESE	ESE	**SE**
Speed	31,6	34,4	33,2	39,9	27,3	32,1	28,6	25,8	22,8	34,3	32,6	26,3	**39,9**

Stormy Days and Strongly Windy Days of the Location Where the Activity is To Be Realized

Annual total number of stormy days is 27.6 as the annual total number of windy days is 118.3 according to Mardin Meteorological Station Observation Records between 1970 and 2012.

Table 18 Numbers of Stormy Days and Strongly Windy Days Between 1970 and 2012

MONTHS	**January**	**February**	**March**	**April**	**May**	**June**	**Temmuz**	**August**	**September**	**October**	**November**	**November**	**Annual Total**
Average Number of Stormy Days	3,4	3,8	3,7	3	2,6	2,5	0,8	0,3	0,7	1,7	2,2	2,9	**27,6**
Average Number of Strongly Windy Days	9,2	8,8	10,7	9,5	11,9	13,4	12	10,2	8,4	8,2	7,4	8,6	**118,3**

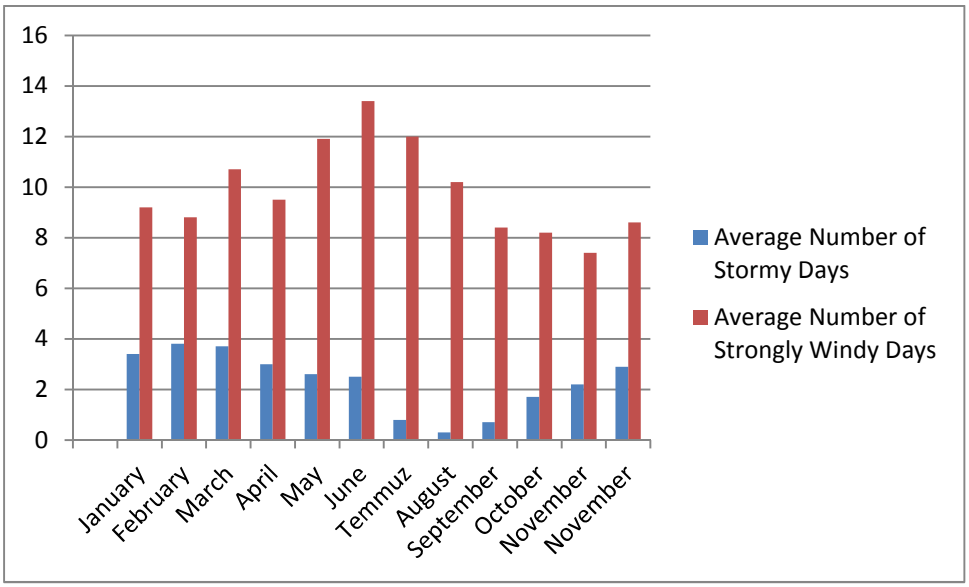


Figure 39 Numbers of Stormy Days and Strongly Windy Days

5.1.7. Ambient Air Quality

Concentrations of NO_2, S, S^-, SO_2, Cl, Cl_2^-, F, F^-, HF, NH_3 and HCl have been measured by means of the passive sampling method in order to determine present air pollution load of the site where the facility is planned to be built and its environs. Passive sampling tubes have been used during air quality measurements. The measurement method has been conducted in compliance with the standards, TS EN 13528-1 and TS EN 13528-2. Air Quality Measurement Report is given in **Annex-14.**

The coordinates of the points at which measurements have been taken under the project are provided by the following table.

Table 19 Coordinates of the Measurement Points

Measurement Point	Measurement Coordinates	
	E	N
1	620644	4151110
2	620198	4151229
3	621671	4152967
4	622223	4148425
5	617533	4150740

6	618953	4150418
7	619765	4151126
8	619898	4151608

The measurement results for 8 individual sampling points which have been designated according to the air quality modeling study are provided by the following tables.

Table 20 Coordinates and Measurement Results for the Passive Sampling Point

Sampling Point	µg Cl (total)	HCL ($\mu g/m^3$)	µg F (total)	HF ($\mu g/m^3$)	µg NO_2 (total)	NO2 ($\mu g/m^3$)	µg S (total)	SO2 ($\mu g/m^3$)	µg NH_4^+ (total)	NH3 ($\mu g/m^3$)
	0,14	2,75	0,24	3,32	0,09	1,91	<0,03	<1,50	0,61	5,69
1. Sampling Point	0,15	2,81	0,26	3,56	0,10	2,05	<0,03	<1,50	0,43	3,48
2. Sampling Point	0,17	3,49	0,21	2,78	0,10	2,11	<0,03	<1,50	1,29	14,01
3. Sampling Point	<0,14	<2,70	0,21	2,78	0,10	2,02	<0,03	<1,50	0,64	6,12
4. Sampling Point	0,20	4,28	0,28	4,01	0,11	2,36	<0,03	<1,50	4,01	46,91
5. Sampling Point	0,17	3,46	0,23	3,11	0,07	1,29	<0,03	<1,50	0,58	5,32
6. Sampling Point	0,18	3,68	0,23	3,09	0,08	1,66	<0,03	<1,50	0,40	3,11
7. Sampling Point	0,17	3,57	0,24	3,21	0,16	3,68	<0,04	1,98	0,76	7,53
8. Sampling Point										

5.1.8. Water Quality

Instantaneous water sample has been taken from Well No 1 which has been dug in connection with the subject Project. The water sample taken has been carried to the analysis laboratory in a sealed plastic and glass container in refrigerated condition under chemical protection in compliance with the standard, TS EN ISO 5667-3. Surface water analysis has been made on the water sample taken. The subject water analysis is provided by **Annex-15**. The results of the Surface Water Analysis conducted in connection therewith have been assessed as per Annex 5 Table 5 of the "Surface Water Quality Regulation". The classification made in the analysis is provided below.

Class I: Yüksek kaliteli su, High quality water

Class II: Slightly polluted water

Class III: Polluted water

Class IV: Highly polluted water

As a result of the assessment made in connection therewith, the concentrations of the metals of lead, copper, nickel and zinc (trace elements) exhibit the characteristics of Class 1 water quality according to the limit values provided in the regulation. It exhibits the characteristics of Class 2 water quality in terms of nitrite nitrogen concentration; It exhibits the characteristics of Class 2 water quality in terms of total phosphor concentration. It is considered that this condition is due to the phosphate rocks in the region. As several parameters exhibit the characteristics of Class 2 water quality with respect to surface waters sampled in the region, the parameters for the organic, inorganic and physical pollutants exhibit the characteristics of Class 1 water quality generally.

5.1.9. Noise

As the points at which measurements would be taken of the background noise level of the facility installed, those areas to be affected have been duly considered in connection therewith. Therefore, background measurements have been taken at a total of 5 points in the vicinity of the facility as well as in the vicinity of the nearest house.

Total noise equivalent to 1/3 octave band and octave band noises have been found out through the background noise level measurements. The background noise level measurements have been taken in compliance with the standards, TS 9315 ISO 1996-1:2005 and TS ISO 1996-2:2009.

Svantek Svan 948 1/3 Octave Band Type 1 measurement device has been employed in the operation site measurements. In measurements, Equivalent Constant Sound Pressure

Levels with Weighted Value A have been taken at an interval of 8 minutes. The distances of the measurement points are provided by the following table.

Table 21 Distances of the Measurement Points

Measurement Points	**Distance to the Project Area**
1.Measurement Point	Inside the Project Area
2.Measurement Point	Inside the Project Area
3.Measurement Point	Inside the Project Area
4.Measurement Point	Inside the Project Area
5.Measurement Point, Nearest House	2000 m

The result of the background noise measurements are provided by the following table.

Table 22 Background Noise Measurements

Day Background	**Birim**	**Leg(A)**
1	dB	42,0
2	dB	42,9
3	dB	39,9
4	dB	40,1
5	dB	46,1

5.2. Biological Environment

5.2.1. Flora

The Project Area is located in Square C-8 when it is evaluated in terms of Davis's Grid System (Flora of Turkey and the East Aegean Islands). The area falls in Iranian – Turanian Region (E.A: East Anatolia) phyto-geographically. Turkey's phyto-geographic regions are provided on the grid system on the following figure.

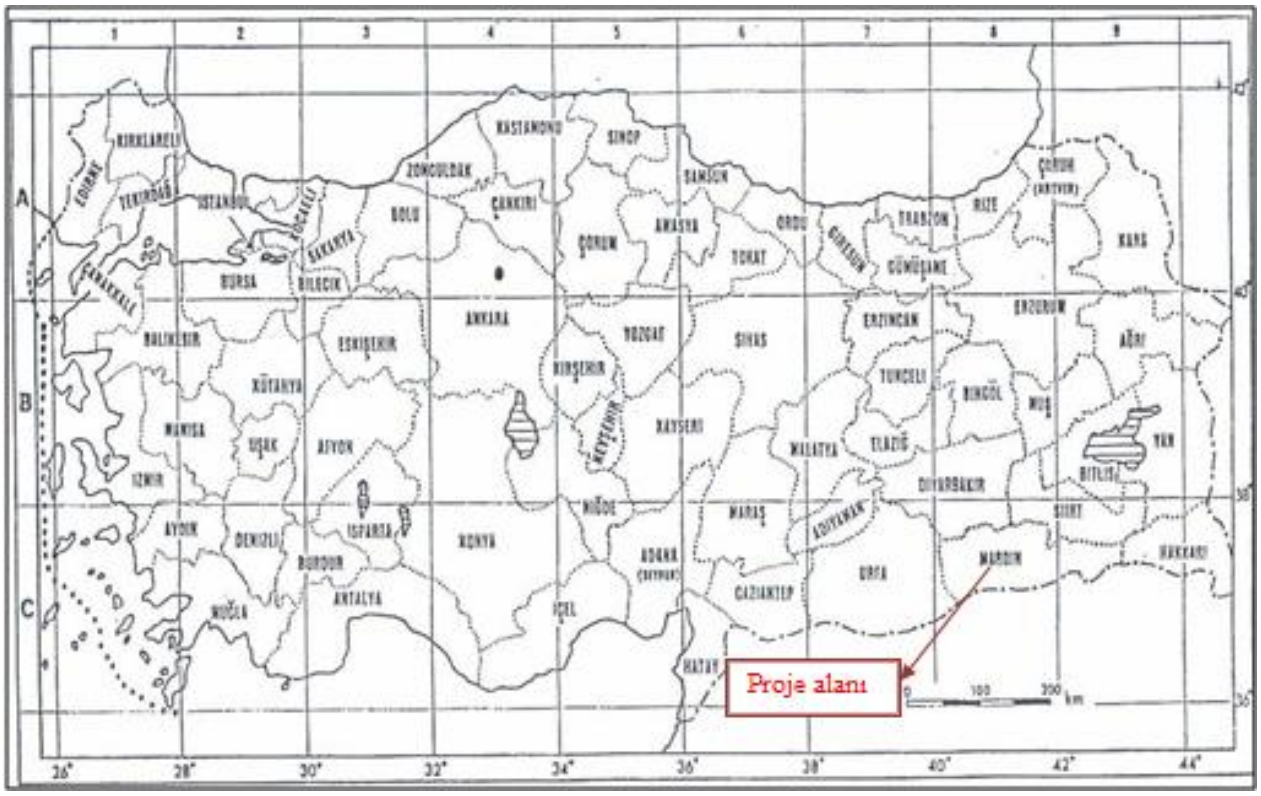


Figure 40 Turkey's Phyto-Geographic Regions [15]

The following figure shows the Vegetation Formations of South-Eastern Anatolia Phyto-Geographic Region.

[15] Davis P.H. Harper P.C. and Hedge I.C. (eds.) 1971. Plant Life of South-West Asia. The Botanical Society of Edinburgh

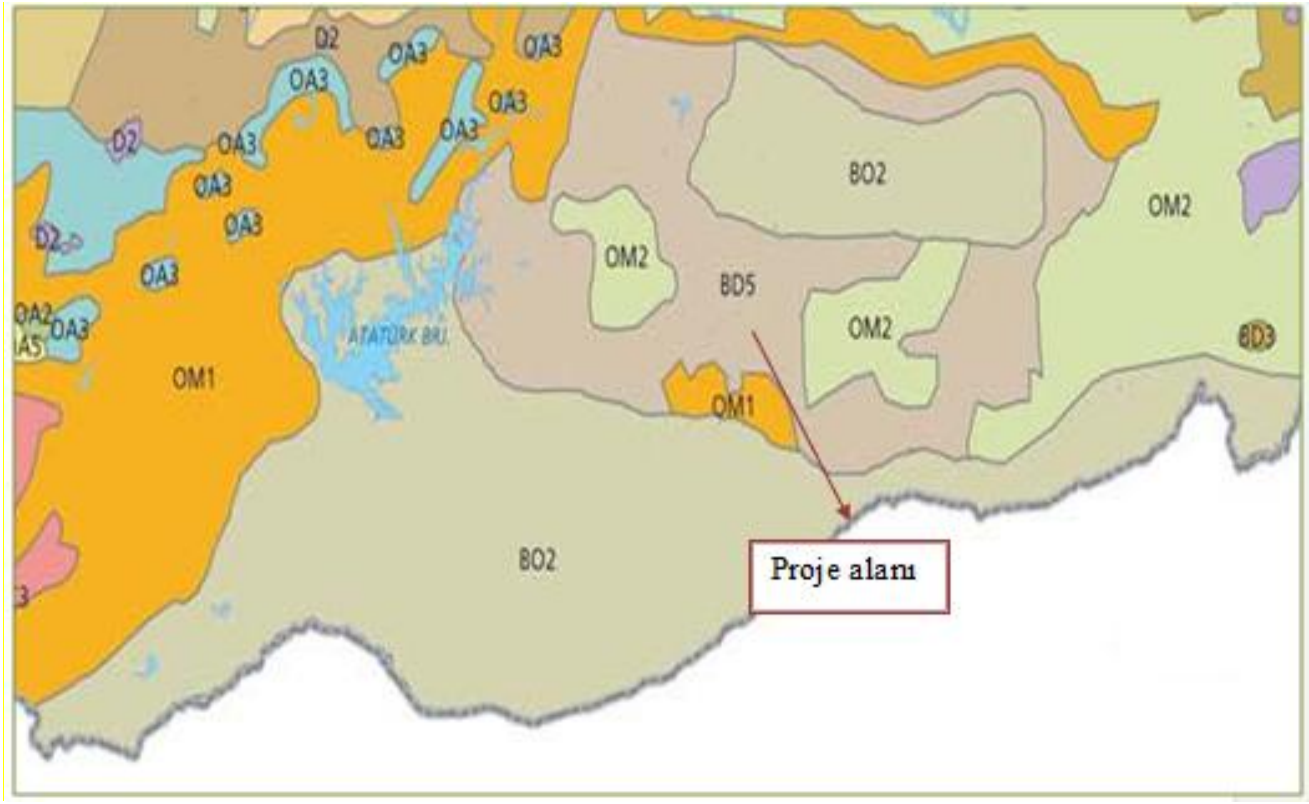


Figure 41 Vegetation Formations of South-Eastern Anatolia Phyto-Geographic Region [16]

Explanations

BO2	South-Eastern Anatolia Plain Steppe
OM1	Kermes Oak Forest (in the form of sporadic forested steppe)
BD5	South-Eastern Anatolia Mointain Steppe
OM2	Eastern Anatolia Oak Forest (in the form of sporadic forested

Field observation has been conducted in May 2013 for the purpose of being able to identify the continental flora of the Project Area and its environs and this field observation has been supported by literature scan. The species which have been identified in the activity area and its immediate surroundings as a result of these studies conducted in connection therewith are

[16] **Source : Türkiye'nin Önemli Doğa Alanları, Doğa Derneği 2006, (Turkey's Major Natural Areas, by the Nature Association) ANKARA**

provided by the following table. This study has specified specific phyto-geographic region elements to which the species belonged to, their endemism status, their habitats and frequencies of their presence in the area, also making an assessment on them according to the national and international risk categories.

The literature studies have been primarily made by making use of the sources called "Türkiye Bitkileri Veri Servisi (Data Service on the Plants in Turkey) (TUBİVES)[17]" and Davis. P.H, Flora Of Turkey And The East Aegean Islands, Vol. 1-10, Edinburg (1965-1988). In order to be able to identify such species placed under protection on a national and international scale, use has been made of the book, "Red Data Book of Turkish Plants [18]" and also, scans have been made in BERN, the Convention on the Protection of European Wild Life and Habitats (1984), CITES Convention, IUCN Red List of Endangered Species, 2008[19] and lists thereof. The Turkish equivalents of the plants have been provided by making use of the book, "Türkçe Bitki Adları Sözlüğü" (A Glossary of Turkish Names of Plants) (Baytop, 1994).

[17] http://turkherb.ibu.edu.tr

[18] Türkiye Bitkileri Kırmızı Kitabı-Türkiye Tabiatını Koruma Derneği, Van 100. Yıl Ünv./Ankara, 2000

[19] http://www.iucnredlist.org

Table 23 Flora List

FAMILY	SPECIES	TURKISH NAME İSİM	LOCAL NAME	PHYTO-GEOGRAPHIC REGION	LOCALITY	AS PER BERN	HABITAT								COVERING ABUNDANCE (Braun-Balanquet Method)					END.			RISK CLASS
							1	2	3	4	5	6	7	8	1	2	3	4	5	L	B	Y	
BORAGİNACEAE	Cynoglossum creticum			-	0-1000 m	-					X		X		X								
BORAGİNACEAE	Echium italicum			Mediterranean	0-1950 m	-					X		X			X							
CARYOPHYLLACEAE	Silene dichotoma			İran-Turan	0-2100	-							X			X							
CARYOPHYLLACEAE	Agrostemma githago	Buğday çiçeği	Karamuk	Euro-Siberia	0-1750 m	-				X						X							
COMPOSİTAE	Anthemis austriaca			İran-Turan	0-1700 m	-				X	X		X			X							
COMPOSİTAE	Filago pyramidata			Mediterranean	0-1200 m	-	X			X			X		X								
COMPOSİTAE	Picnomon acarna			Mediterranean	-	-					X	X			X								
COMPOSİTAE	Senecio vernalis	Ekin otu		İran-Turan	0-1700 m	-				X				X		X							
COMPOSİTAE	Tragopogon longirostris			İran-Turan	0-2300	-				X			X				X						
CRUCİFERAE	Descurainia sophia			İran-Turan	300-1750 m	-							X	X		X							
DİPSACACEAE	Scabiosa argentea	Uyuz otu	Kum otu	Mediterranean	0-2500 m	-				X			X			X							
VİTACEAE	Vitis vinifera	Asma		Euro-Siberia	-	-				X							X						
CONVOLVULACEAE	Convolvulus arvensis	Tarla sarmaşığı	Çadır çiçeği	İran-Turan	0-3050 m	-				X	X						X						
MALVACEAE	Malva neglecta		Küçük Ebegümeci	Euro-Siberia	-	-					X					X							
LABİATAE	Teucrium polium	Acı yavşan	Peryavşan	Mediterranean	0-2050 m	-							X	X			X						
LABİATAE	Prunella vulgaris			Euro-Siberia	0-2900 m	-				X			X				X						
LABİATAE	Ziziphora capitata			İran-Turan	0-2200 m	-				X							X						

FAMILY	SPECIES	TURKISH NAME İSİM	LOCAL NAME	PHYTO-GEOGRAPHIC REGION	LOCALITY	AS PER BERN	HABITAT								COVERING ABUNDANCE (Braun-Balanquet Method)					END.			RISK CLASS
							1	2	3	4	5	6	7	8	1	2	3	4	5	L	B	Y	
ZYGOPHYLLACEAE	Peganum harmala	Üzerlik	Nazar otu	İran-Turan	0-1500 m	-					X		X				X						
UMBELLİFERAE	Scandix stellata			İran-Turan	300-2190	-							X		X								
UMBELLİFERAE	Turgenia latifolia			Euro-Siberia	0-3000	-								X	X								
ONAGRACEAE	Epilobium hirsutum			Mediterranean	0-2300	-							X		X								
CYPERACEAE	Carex divisa			Euro-Siberia	0-2800 m	-																	
LİLİACEAE	Allium paniculatum ssp. paniculatum			Mediterranean	0-2000 m	-							X	X		X							
GRAMİNEAE	Poa bulbosa			Euro-Siberia	0-3000 m	-					X					X							
GRAMİNEAE	Tritucum aestivum			Euro-Siberia	10-2500 m	-					X						X						
GRAMİNEAE	Avena sterilis ssp sterilis			Mediterranean	0-1800 m	-				X				X		X							

The publication titled ‘Red Data Book of Turkish Plants’ Türkiye Tabiatı Koruma Derneği ve Van 100. Yıl Üniversitesi 2000 has been scanned in order to identify such plant specifies specified above, which are endangered and no endangered plant species have been identified in connection therewith. In addition, there are no such specifies which are placed under control according to the national and international conventions.

5.2.2.Fauna

The wild life groups which are likely to live / have been identified in the region of which the activity area is a part are indicated by the following lists.

Table 24 Fauna Table/Birds

Latin Name	Turkish Name	English Name	EVRDB	IUCN	END	BERN Convention	MAK (2013-2014)	SOURCE
AVES	**BIRDS**							
SET: FALCONİFORMES	Doğanlar							
FAM: FALCONİDAE	Doğangiller							
Sp: Falco tinnunculus	Kerkenez	Kestrel	A-4	LC	-	Annex II	Annex List I	L, A
SET: GALLİFORMES	Tavuklar							
FAM: PHASİANİDAE	Tavuksular							
Sp: Coturnix coturnix	Bıldırcın	Quail	A-4	LC	-	Annex III	Annex List III	L, A, G
SET: COLUMBİFORMES	Güvercinler							
FAM: COLUMBİDAE	Güvercingiller							
Sp: Columba livia	Kaya Güvercini	Domestic Pigeon	A-4	**LC**	-	Annex III	Annex List III	L, A, G
Sp: Streptopelia decaocto	Kumru	Collarede Dove	A-4	**LC**	-	Annex III	Annex List II	L, A
SET: PASSERİFORMES	Ötücü Birds							
FAM: ALAUDİDAE	Tarlakuşugiller							
Sp: Eremophila alpestris	Kulaklı Tarlakuşu	Shore Lark	-	LC	-	Annex II	Annex List I	L, A
FAM: TURDİDAE	Ardıçkuşugiller							
Sp: Saxicola torquata	Taşkuşu	Stonechat	-	LC	-	Annex II	Annex List I	L
FAM: CORVİDAE	Kargagiller							
Sp: Pica pica	Saksağan	Magpie	-	LC		-	Annex List III	L, A, G
Sp: Corvus monedula	Cüce Karga	Jackdow	-	LC	-	-	Annex List III	L, A, G
Sp: Corvus corone cornix	Leş Kargası	Hooded	-	LC	-	-	Annex List III	L
Sp: Corvus corax	Kara Karga	Roven	-	LC	-	Annex III	Annex List II	L, A
FAM: STURNİDAE	Sığırcıkgiller							
Sp: Sturnus vulgaris	Sığırcık	Starling	--	LC	-	-	Annex List II	L, A, G
FAM: PASSERİDAE	Serçegiller							
Sp: Passer domesticus	Ev serçesi	House Sparrow	-	LC	-	-	Annex List III	L, A, G
FAM: EMBERİZİDAE								

Sp: Emberiza calandra	Tarla kirazkuşu	Corn Bunting	-	LC	-	Annex III	Annex List II	L

Table 25 List of the Species of Reptiles, Amphibians and Mammals

Latin Name	**Turkish Name**	**ERL**	**END**	**IUCN**	**BERN Convention**	**MAK (2013-2014)**	**SOURCE**	**HABITAT**	**Observation Station**
MAMMALİA	**MEMELİLER**								
SET: CHİROPTERA	Yarasalar								
FAM: VESPERTİLİONİDAE	Düzburun Yarasalar								
CİNS: Nyctalus									
Sp: Nyctalus noctula	Akşamcıyarasa	V	-	LC	Annex II	Annex List I	L, A	Everywhere, particularly in areas outside forests	-
SET: RODENTİA	Kemiriciler								
ALT SET: MYOMORPHA	Fare Benzeri Sincaplar								
FAM: SPALACİDAE	Körfareler								
CİNS: Spalax									
Sp: Spalax ehrenbergi	Kösnü	Nt	-	DD	-	-	L, A	In vineyards and orchards	-
Latin Name	**Turkish Name**	**ERL**	**END**	**IUCN**	**BERN Convention**	**MAK (2013-2014)**	**SOURCE**	**HABITAT**	**Observation Station**
REPTİLİA	**SÜRÜNGENLER**								
SET: SQUAMATA	Kertenkeleler								
ALT SET: LACERTİLİA	Kertenkeleler								

FAM: GEKKONİDAE	Ev Kelerleri								
CİNS: Cyrtodactylus									
Sp: Cyrtodactylus heterocercus	Mardin Keleri	Nt		-	-	Annex List I	L, A	They are frequently present on the house walls	
AMPHIBIA	**AMFİBİLER**								
SET: ANURA	Kuyruksuzkurbağalar								
ALTTAKIM: PROCOELA	Karakurbağaları								
CİNS: Bufo									
Sp: Bufo viridis	Gece Kurbağası	Nt	-	LC	Annex II	-	L	They live in dry areas.	-

ERL **:** European Red List **EVRDB** **:** European Vertabrate Red Data Book

MAK (2013-2014) **:** Decisions by the Central Hunting Commission
END **:** Endemic

KAYNAK

A: Information received from local people) **G:** Observation **L:** Literature

A review has been made of the Convention on the International Trade of Endangered Species of Wild Animals and Plants (CITES) in connection with international trade of the above mentioned species. There are no species or sub-species covered by this convention, which are in the region's flora list. Again, 1 species, which is included in this convention and has habitat in the region, has been identified in the region's fauna list. This species is: ***Columba livia*** (kaya güvercini) (Annex III). Accordingly,

Regulation of trade in specimens of species included in Appendix III

Article V -

1. All trade in specimens of species included in Appendix III shall be in accordance with the provisions of this Article.

2. The export of any specimen of a species included in Appendix III from any State which has included that species in Appendix III shall require the prior grant and presentation of an export permit. An export permit shall only be granted when the following conditions have been met:

(a) Management Authority of the State of export is satisfied that the specimen was not obtained in contravention of the laws of that State for the protection of fauna and flora; and

(b) Management Authority of the State of export is satisfied that any living specimen will be so prepared and shipped as to minimize the risk of injury, damage to health or cruel treatment.

3.The import of any specimen of a species included in Appendix III shall require, except in circumstances to which paragraph 4 of this Article applies, the prior presentation of a certificate of origin and, where the import is from a State which has included that species in Appendix III, an export permit.

4.In the case of re-export, a certificate granted by the Management Authority of the State of re-export that the specimen was processed in that State or is being re-exported shall be accepted by the State of import as evidence that the provisions of the present Convention have been complied with in respect of the specimen concerned.

In order to identify those of the above mentioned species, which are placed under protection, Turkish Environmental Legislation 'Convention on the Preservation of European Wild Life and Habitats' and its annexes have been reviewed. The species which are placed under protection according to Bern Convention have been indicated.

The fauna species placed under protection are divided into two categories according to Bern Convention.

II	Species placed under strict protection
III	Protected species

Bern Convention Article 6

Each Contracting Party shall take appropriate and necessary legislative and administrative measures to ensure the special protection of the wild fauna species specified in Appendix II. The following will in particular be prohibited for these species:

a all forms of deliberate capture and keeping and deliberate killing;

b the deliberate damage to or destruction of breeding or resting sites;

c 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;

d the deliberate destruction or taking of eggs from the wild or keeping these eggs even if empty;

e the possession of and internal trade in these animals, alive or dead, including stuffed animals and any readily recognisable part or derivative thereof, where this would contribute to the effectiveness of the provisions of this article.

Bern Convention Article 7

1 Each Contracting Party shall take appropriate and necessary legislative and administrative measures to ensure the protection of the wild fauna species specified in Appendix III.

2 Any exploitation of wild fauna specified in Appendix III shall be regulated in order to keep the populations out of danger, taking into account the requirements of Article 2.

3 Measures to be taken shall include:

a closed seasons and/or other procedures regulating the exploitation;

b the temporary or local prohibition of exploitation, as appropriate, in order to restore satisfactory population levels;

c the regulation as appropriate of sale, keeping for sale, transport for sale or offering for sale of live and dead wild animals.

The species of fauna which are placed under protection as per IUCN are classified as follows:

EX (Extinct)	Extinct
EW (Extinct in the Wild)	Extinct in the Wild
CR (Critically Endangered)	Critically Endangered
EN (Endangered)	Endangered
VU (Vulnerable)	Vulnerable
NT (Near Threatened)	Near Threatened
LC (Least Concern)	Least Concern
DD (Data Deficient)	Data Deficient
NE (Not Evaluated)	Not Evaluated

Some bird species which are placed under protection under national and international legislation and defined as being existing in the vicinity of the Project Area on the basis of the book, "Türkiye'nin Kuşları" (Turkey's Birds) are classified as follows as per the categories in "Red Data Book[20]":

A.1	Endangered
A.2	Severely threatened
A.3	Threatened
A.4	Giving out signals of potential risk
Cateory B	Migratory – Transitory Species

The categories which are indicated in the following table have been classified as per the Decision for the Hunting Period for 2011 – 2012 by the Central Hunting Commission within the General Directorate for Preservation of Nature and National Parks, Ministry Of Forestry And Hydraulic Works, which took force after it was published in the Official Gazette.

Annex List I	Wild animals which are placed by the Ministry of Environment and Forestry under protection
Annex List II	Hunting animals which are placed by the Central Hunting Commission under protection
Annex List III	Hunting animals which are allowed by the Central Hunting Commission to be hunted in certain periods

[20] ERZ, 1977; HEINWALD et all., 1981; BAYERISCHE STAATSMINISTEIUM 1982 a and b; GEEP 1984

For such species included in the protection lists for the Hunting Period of 2011 – 2012, which has been prepared in line with the decisions of the Central Hunting Commission within the General Directorate for Preservation of Nature and National Parks, Ministry of Environment and Forestry, Republic of Turkey, action shall be duly taken in compliance with the protection measures set forth by the decisions of this commission. In addition, the provisions of BERN Convention and CITES Convention shall also be strictly complied to.

5.2.3.Sensitive Areas

Considering the List of Sensitive Locations in Annex V to ÇED / EIA Regulation, in the Project Area and its environs,

1. Areas which must be protected as per the national legislation

a) National parks", "Nature Parks", "Natural Monuments" and "Nature Preservation Areas" defined by Article and designated by Article 3 of Law No 2873 of 9/8/1983 on the National Parks

There are no "National parks", "Nature Parks", "Natural Monuments" and "Nature Preservation Areas" inside the said project area and its immediate environs.

b)"Wild Life Protection Sites and Wild Animals Accommodation Areas" as designated by the Forestry Ministry pursuant to Law No 4915 of 1/7/2003 on Terrestrial Hunting

700 ea. partridges have been released into the nature under cooperation of Mazıdağı Hunters and Bee Keepers Association for the purpose of developing wild life and reducing caterpillar harmful elements in the forests and an area of approximately 500 hectares has been declared Wild Life Development Site and closed to hunting.

c)"Areas, which are defined as "cultural assets", "natural assets", "preservation sites" and "protection areas" by sub-paragraphs 1, 2, 3 and 5 of paragraph (a) titled, "Definitions", of Sub-clause one of Article 3 of Law No 2863 of 21/7/1983 on the Protection of Cultural and Natural Assets and determined and registered as per the relevant articles of the same law and Law No 3386 of 17/6/1987 (law amending some articles of Law No 2863 on the Protection of Cultural and Natural Assets and supplementing some articles to this law)

There are no cultural and natural assets requiring protection and preservation sites and protection areas in the facility area and its immediate vicinity.

ç) Aqua Products Production and Reproduction Sites covered by Law No 1380 of 22/3/1971 on the Aqua Products

There are no aqua products production and reproduction sites inside the facility area. Berrah Brook having seasonal flow and a distance of about 90 m passeses in the northeast of the facility site as Kumlu Dere again having seasonal flow and a distance of about 120 m passeses in the northwest of the facility site. In addition, Kocakent Dam Lake is located approximately 500 m northeast of the facility site.

d) Areas defined by Articles 17, 18, 19 and 20 of the "Regulation on the Control of Water Pollution" which took force after it was issued in the Official Gazette Issue No 25687 of 31.12.2004

In the project area and its immediate environs, there are no Areas defined by Articles 17, 18, 19 and 20 of the "Regulation on the Control of Water Pollution" which took force after it was issued in the Official Gazette Issue No 25687.

e) "Sensitive Pollution Zones" defined by Article 49 of the Regulation on the Protection of Air Quality which took force after it was issued in the Official Gazette Issue No 19269 of 2/11/1986,

In the project area and its immediate environs, there are no "Sensitive Pollution Zones" defined by Article 49 of the Regulation on the Protection of Air Quality which took force after it was issued in the Official Gazette Issue No 19269.

f) Areas determined and declared by the Cabinet as "Particular Environmental Protection Zones" as per Article 9 of Law No 2872 of 9/8/1983 on Environment

There are no Areas determined and declared by the Cabinet as "Particular Environmental Protection Zones" as per Article 9 of Law No 2872 on Environment inside the project area and its immediate environs.

g) Areas placed under protection as per Law No 2960 of 18/11/1983 on the Bosporus

There are no Areas placed under protection as per Law No 2960 on the Bosporus inside the project area and its immediate environs.

ğ) Locations considered forest areas as per Law No 6831 of 31/8/1956 on Forestry

ınside the said Project site, there are no Locations considered forest areas as per Law No 6831 on Forestry. The site made available to SÜMER HOLDİNG A.Ş. in a forest area of

475,108 m2 in the territories of Mazıdağı Forest Management Chief's Office has been transferred to ETİ BAKIR A.Ş.

h) Areas in respect of which there is a ban on construction development as per Law no 3621 of 4/4/1990 on Coasts

There are no Areas in respect of which there is a ban on construction development as per Law no 3621 on Coasts inside the project area and its immediate environs.

ı) Areas determined by Law No 3573 of 26/1/1939 on the Rehabilitation of Olive Groves and Grafting of Wild Olive Trees,

There are no Areas determined by Law No 3573 on the Rehabilitation of Olive Groves and Grafting of Wild Olive Trees inside the project area and its immediate environs

i) Areas which are indicated by Law No 4342 of 25/2/1998 on Pasture

There is no land having the quality of pasture inside the facility area.

j) Areas indicated by the "Regulation on the Protection of Wetlands" which took force after it was issued in the Official Gazette Issue No 25818 of 17/5/2005

Inside the subject Project site and Its Immediate Vicinity, there are no areas indicated by the "Regulation on the Protection of Wetlands" which took force after it was issued in the Official Gazette Issue No 25818. Berrah Brook having seasonal flow and a distance of about 90 m passeses in the northeast of the facility site as Kumlu Dere again having seasonal flow and a distance of about 120 m passeses in the northwest of the facility site. In addition, Kocakent Dam Lake is located approximately 500 m northeast of the facility site. No intervention shall be made with the brook beds.

2. Areas which must be protected as per the international conventions to which our country is a signatory

a)"Mediterranean Seals Habitat and Reproductive Zones", under Preservation Zones I and II as specified by "Major Sea Turtle Reproductive Zones", which are part of the zones placed under protection as per the "Convention on the Protection of Wildlife and Habitats in Europe" (BERN CONVENTION) taking force upon promulgation in Official Gazette No 18318 of 20/2/1984

There are no "Mediterranean Seals Habitat and Reproductive Zones", under Preservation Zones I and II as specified by "Major Sea Turtle Reproductive Zones", which are part of the zones placed under protection as per the "Convention on the Protection of Wildlife and

Habitats in Europe" (BERN CONVENTION) taking force upon promulgation in Official Gazette No 18318, inside the project area and its immediate environs

b) Areas placed under conservation pursuant to the "Convention on the Protection of the Mediterranean Sea Against Pollution" (Barcelona Convention) taking force upon promulgation in Official Gazette No 17368 of 12/6/1981

There are no Areas placed under conservation pursuant to the "Convention on the Protection of the Mediterranean Sea Against Pollution" (Barcelona Convention) taking force upon promulgation in Official Gazette No 17368 inside the project area and its immediate environs.

ı) areas designated as "special protection zones" in the country pursuant to the "Protocol on the Protection of Special Conservation Areas in the Mediterranean Region" taking force upon promulgation in Official Gazette No 19968 of 23/10/1988

There are no areas designated as "special protection zones" in the country pursuant to the "Protocol on the Protection of Special Conservation Areas in the Mediterranean Region" taking force upon promulgation in Official Gazette No 19968 inside the project area and its immediate environs.

ıı) areas included in the "List of 100 Coastal Historical Sites of Common Significance in the Mediterranean Sea" published by the United Nations Environmental Program, which are selected pursuant to the Genoa Declaration of 13/9/1985

There are no areas included in the "List of 100 Coastal Historical Sites of Common Significance in the Mediterranean Sea" published by the United Nations Environmental Program, which are selected pursuant to the Genoa Declaration of 13/9/1985 inside the project area and its immediate environs.

ıı) coastal areas which are habitats of "Mediterranean Specific Endangered Sea Species Faces Extinction", which are covered by Article 17 of Genoa Declaration

There are no coastal areas which are habitats of "Mediterranean Specific Endangered Sea Species Faces Extinction", which are covered by Article 17 of Genoa Declaration inside the project area and its immediate environs.

c) "cultural, historical and natural sites placed under conservation and granted a status as "cultural heritage" and "natural heritage" by the Culture Ministry as per Articles 1 and 2 of "the Convention on the Preservation of Global Culture and Natural Heritage" taking force upon promulgation in Official Gazette No 17959 of 14/2/1983

There are no cultural, historical and natural sites placed under conservation and granted a status as "cultural heritage" and "natural heritage" by the Culture Ministry as per Articles 1 and 2 of "the Convention on the Preservation of Global Culture and Natural Heritage" taking force upon promulgation in Official Gazette No 17959 inside the project area and its immediate environs.

ç) areas placed under preservation as per "the Convention on the Preservation of Wetlands of International Significance Especially As the Habitat of Water Birds" (RAMSAR Convention) taking force upon promulgation in Official Gazette No 21937 of 17/05/1994

There are no areas placed under preservation as per "the Convention on the Preservation of Wetlands of International Significance Especially As the Habitat of Water Birds" (RAMSAR Convention) taking force upon promulgation in Official Gazette No 21937 inside the project area and its immediate environs.

d) European Convention on Landscaping which took force after it was issued in the Official Gazette Issue No 25181 of 27/7/2003

There are no areas falling in the scope of the European Convention on Landscaping which took force after it was issued in the Official Gazette Issue No 25181 inside the project area and its immediate environs.

3. Areas which must be protected

a) areas which are designated by the approved environmental arrangement plans as the zones for preservation of their existing characteristics, where it is prohibited to carry out any construction development operations (biogenetic reserves, geothermal zones, etc., where natural characteristics are to be preserved)

According to 1/100,000 Scale Approved Environmental Order Plan which is provided by **Annex-16,** the facility area is located on the Ecologically Important Areas, Areas Where Tree Character is To Be Preserved and Agricultural Land. The following figure provides cross sections from the Environmental Order Plan which shows the facility area.

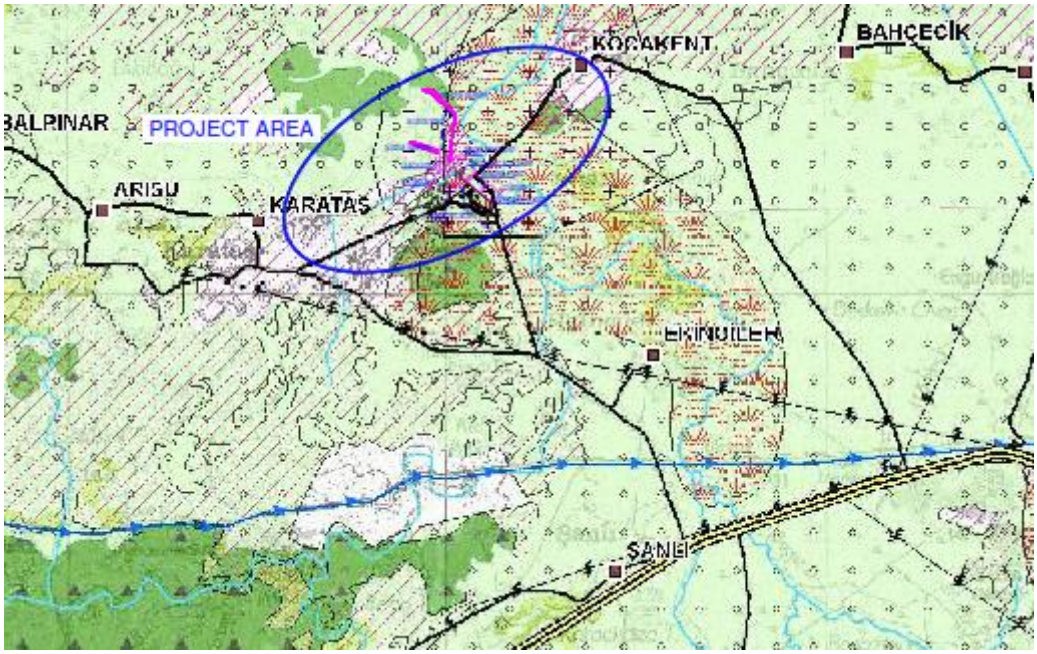


Figure 42 Cross Section From The Environmental Order Plan İndicating The Project Area

b) Agricultural areas: It is not within any agricultural development areas, areas having Classes I, II, III and IV, where irrigation is feasible and there is field use capability, Class I and II areas used for agriculture based on precipitation as well as plantation areas for particular products

Land Use Map and are provided by Annex-10. According to Scale Land Use Map, a large section of the facility area Project Area is located on Class II land where dry agriculture without fallow is carried out. In agricultural areas shown in maps, are not carried out any agricultural activity in present situation.

c) Wetlands: It is not within any water courses, quagmires, rushy / reedy locations and peat moors and those portions of these areas, which remain as wetland ecologically from the coastal strips to the hinterland, which cover depths of not more than 6 meters in the ebbing phase of the tidal movements of natural or artificial, permanent or temporary waters and stagnant or flowing, fresh or salty seas and have significance as the habitats of living organisms, particularly water birds

Berrah Brook having seasonal flow and a distance of about 90 m passeses in the northeast of the facility site as Kumlu Dere again having seasonal flow and a distance of about 120 m passeses in the northwest of the facility site. In addition, Kocakent Dam Lake is located approximately 500 m northeast of the facility site. No intervention shall be made with the brook beds.

ç) lakes, streams and underground operational sites

Lakes, Ponds and Reservoirs

Although there are no natural lakes in the Province of Mardin, there are 3 manmade lakes (ponds). They are: Yıldız-Artabe Göleti, Şerifbaba Göleti, Hanokbaba Irrigation Göleti.

Streams

Brook of Çağ Çağ is the most important stream in the provincial territories. Brook of Çağ Çağ is located in the territories of the District of Nusaybin and comprises two offshoots – Karasu and Beyazsu.

d) habitats of those species, which are of particular importance for scientific research and / or endangered facing extinction or may face such a risk and are endemic for the country, including any areas, biosphere reserves, biotopes, biogenetic reserves and areas with geologic and geo-morphologic formations having unique features

There are no habitats of those species, which are of particular importance for scientific research and / or endangered facing extinction or may face such a risk and are endemic for the country, including any areas, biosphere reserves, biotopes, biogenetic reserves and areas with geologic and geo-morphologic formations having unique features, inside the project area and its immediate environs.

5.3. Social Environment

5.3.1. Economy

Agriculture, Livestock and Forestry

Agriculture ranks first in Mardin's economy. Agriculture is carried out on 3,854,790 ha of lando out of the total land of approximately 8,891,000 hectares. Almost the entire agricultural land is used for field agriculture. Those areas used for fruit and flower gardens and fruit agriculture are smaller than field agriculture areas.[21]

Use of modern agricultural vehicles and procedures has just started. Major agricultural produce comprise wheat, barley, rice, chickpeas and cotton. Fruit cultivation is carried out by the River of Tigris. Early season vegetable production is in a developed condition. Tomatoes, eggplants, cucumbers, melons and water melons are mostly produced. Grapes rank first in fruit production. Walnuts, pomegranates and pistachios are also grown. Some people refer to Mardin as the land of grapes. It ranks fourth with grape production of more than 150 thousand tons nationwide. It as the tenth ranking in nationwide water melon production.

Hayvancılığın il ekonomisinde önemli yeri vardır. Tarım üretiminin üçte biri hayvancılıktan sağlanır. Yerli göçerler, hayvanlarıyla yaylayla ova arasında göç ederler. Devamlı yerleşim merkezi olmayan göçebe aşiretler vardır. Livestock has a significant place in the provincial economy. One third of agricultural production is accounted for by livestock.

Mardin is considered poor in terms of forest assets. There is a total area of forest and heathland amounting to 200 thousand hectares. All the forests are included in the class of deterioriated coppice forest.[22]

District of Mazıdağı

Its economy is dependent on agriculture. Its major agricultural produce comprise wheat, grapes, barley and lentils and besides, low volumes of chickpeas and figs are also produced. Livestock is the source of revenue having primary significance economically. Thanks to the production methods on the high plateaus, sheep, goat and Ankaran goats are raised.[23]

Industry

The composition of the traditional economy of the Province of Mardin depends on agriculture and trade. Capital movement as part of this composition takes place largely in such zones in the west where industry is dense.

[21] http://www.mardin.gov.tr

[22] http://www.cografya.gen.tr/tr/mardin/ekonomi.html

[23] http://www.cografya.gen.tr/tr/mardin/ilceler.html

Industrial development has initially been pioneered by the Special Provincial Administration, Development Bank and Public Economic Enterprises. These facilities are principally:

Mardin Cement Plant

Kızıltepe Fodder Plant

Mardin Pipe Plant

Mardin Lime Plant

On the other hand, as small industrialists and tradesmen operating in various business branches initially maintained their operations at various places in the province in an uncentralized condition, these small industrialists completed Part 1 of the first small industrial zone in Mardin in 1984, thus starting operations at 190 workplaces in the zone. Mardin Organized Industrial Zone began being built in 1976 for development of the provincial industry and ensuring regular structural development in the province and it was completed and put into service in 1992. In addition, in 1994, Mardin Free Zone was established on a land area of 516,000 m2 inside the Organized Industrial Zone. Besides, the following industrial plants currently operate: Brick Plant and Ahmetler and Metal Ready Concrete Plant and Ninve Wine Facility in Midyat; Gülbahar Chemical Recycling Plant, Aysan Vegetal Oil Production Facility, Markim Paint Plant, Municipal Asphalt Plant and Nus-Concrete Ready Concrete Plant in Nusaybin; Türkler and Mehmet Sales Ready Concrete Facilities and Dem-Yol Asphalt Plant in Kızıltepe.

Mazıdağı

There are no industrial entities in the District of Mazıdağı based on our analysis of the industry of the Province of Mardin by district.[24]

Mining

The Province of Mardin is one of those provinces which are poor in terms of mineral diversity and potential. There are particularlyindustrial feedstock resources in the Province. They are principally marble and quartz sand, particularly cement feedstock.

The phosphate explorations which picked up in the country in 1961 were carried out by MTA and phosphate deposits, which are located in the South-Eastern Anatolia Region, were discovered in these Works. Mazıdağı phosphate deposits are the most important ones of such deposits. 4 major deposits – Taşıt, Kasrık, Şemikan and Akras Phosphate Deposits – have been found out in Mazıdağı Region.

Mazıdağı Region: MTA has discovered Taşıt phosphate rocks with potential reserves of 260 million tons with low grade clay carbonate gang containing 8 – 15 % P205. These deposits are not considered economically viable because their production costs are high. There are 75.5

[24] Mardin Provincial Environmental Status Report, 2011

million tons of exploitable sedimentary type phosphate reserves with 15 – 21 % P205 content suitable for open and contained operation at Mazıdağı-Kasrık-Şemikan phosphate deposits for which detailed studies have been carried out by MTA. 68.2 million tons of phosphate reserves now remain at the deposit which was operated until 1993. Akras phosphates are of glauconite type and contains 8 – 15 % P205. There is phosphate potential of 2.5 – 3 million tons rich in terms of iron and aluminum oxides. These phosphates not suitable for enrichment may be directly used by grinding them in acidic characterized soils. However, it is not cost effective because its cover thickness is excessive.[25]

5.3.2. Demography

Total popuation consists of 391.422 men and 388.316 women.

Urban population of province is 41 % and rural population is 59%.[26]

Table 26 Mardin Province Population f 2013[27]

	Total	**Men**	**Women**
Turkey – Total Population	76.667.864	38.473.360	38.194.504
Mardin – Provincial Population	779.738	391.422	388.316
Mardin – Provincial / District Centers Population	779.738	391.422	388.316

Mazıdağı District population is 33.083 according to 2013 Address Based Population Registration System (ADKNS).[28]

Migrations

25http://www.mta.gov.tr/v2.0/turkiye_maden/maden_potansiyel_2010/Mardin_Madenler.pdf

26 www.tuik.gov.tr

27 TÜİK

28 www.tuik.gov.tr

Urban population growth rate is greater than rural growth rate since 2000. This shows that migratin was occured from rural to urban. Some districts such as Kızıltepe, Midyat, Nusaybin exceed over Central District.

Especially after 2008, diffarance of rural and urban population increase so much. The reasons of this migtarion are job opportunities and education opportunities.[29]

Population Growth Rate

Table 27 Population Growth and Density in Mardin, 2013[30]

Years	Population	(‰) Population Growth Rate	Population Density (person/km²)
1990	557.727	-	85
1997	654.278	17.31	85
2000	705.098	7.77	84
2007	745.778	5.79	85
2010	744.606	-1.06	82
2011	764.033	2.5	87
2012	773.026	1.05	88
2013	779.738	1.04	89

Mardin includes 1.01 % population of Turkey with 764.033 people in 2011. The annual growth rate is smaller than Turkey avarage growth rate alue because of the migration from Mardin. The population increase rate is ‰ 1.05 in 2011 and 2012 and ‰ 1.04 in 2013.[31]

5.3.3. Education

29 Mardin İl Çevre Durum Raporu, 2012

30 TÜİK

31 www.tuik.gov.tr

There are a total of 1,163 schools throughout the Province of Mardin. These schools have a total of 5,673 classrooms. As 213,004 students receive education in these schools, a total of 9,290 teachers serve them. The number of students per classrom is 39, 40 and 31 in primary education, secondary education and vocational and technical education, respectively. [32]

There are a total of 96 schools in the District of Mazıdağı. In these schools, there are 9,507 students receiving education and 458 teachers serving them. [33]

5.3.4. Health

The distribution of health care institutions in the Province of Mardin and its districts is provided by the following table.

Table 28 Health Care Institutions in the Province of Mardin and its Districts[34]

Districts	Population	State Hospitals	SSK Hospital	Health Care Station	Tuberclosis Control Dispensary	Public Health	Ap-Açs Center	Health Vocational High School	Health Care Centers
Merkez	128.477	2	-	15	1	1	1	1	11
Dargeçit	27.828	-	-	1	-	-	-	-	4
Derik	58.213	1	-	6	-	-	-	-	4
Kızıltepe	212.905	1	-	12	-	-	1	-	10
Mazıdağı	33.184	-	-	2	-	-	-	-	3
Midyat	106.848	1	-	15	1	-	-	-	8
Nusaybin	112.790	1	-	7	-	-	1	-	7
Ömerli	15.010	-	-	2	-	-	-	-	4
Savur	31.817	-	-	5	-	-	-	-	7
Yeşilli	17.534	-	-	3	-	-	-	-	-

[32] http://mardin.meb.gov.tr/

[33] http://mazidagi.meb.gov.tr/

34 http://cdr.cevre.gov.tr/2010_icdrler/mardinicd2010.pdf

Toplam	**744.606**	**6**	**-**	**68**	**2**	**1**	**3**	**1**	**58**

1 District State Hospital provides services to the public in the District of Mazıdağı. In addition, there are 2 health care stations at the Villages of Evciler and Yukarıkonak as there are 5 health care centers at the Villages of Kocakent, Gümüşpınar, Işıkyaka, Şenyuva and Tarlacık providing services to people. The district hospital has 25 beds and accommodates EKG, X-Ray and Analysis Devices as well as a number of other instruments. [35]

5.3.5. Income and Unemployement

The following table indicates basic labor force status in the Province of Mardin as at 2011. Unemployed population in the population in the age bracket of 15 and higher is indicated as 20 persons as the rate of unemployment is determined at 10.3 %.

Table 29 Basic Labor Force Indicators on a Provincial Basis fort he Province of Mardin[36]

	Population in the age bracket of 15 and higher	**Labor Force**	**Employment**	**Unemployed**	**Population Not Included in Labor Force**	**Rate of participation in labor force(%)**	**Employment Rate (%)**	**Unemployment Rate (%)**
Mardin	471	198	177	20	274	41,9	37,6	10,3

Under State Planning Organization (SPO / DPT) Executive Measures covering 1974 and 1975, the task of “meeting local phosphate rock requirements through indigenous resources” has been transferred from MTA to Etibank. The licenses of all the phosphate rock deposits located in the Region of Mazıdağı – Mardin have also been transferred to Etibank. It was closed in 1994 on ground of “losses” upon the economic crisis which led to the introduction of the Measures of April 5, 1994 although investment worth 125 million Dollars was made after it was established in 1997 and put into operation in 1988.

Mazıdağı Phosphate Facility, which was one of the most important projects on the agenda of the national minining industry in the 1970’s and 1980’s, could not be successful because there was no fertilizer facility which could make use of phospate concentrate regionally produced and the cost of transporting the product to the fertilizer facilities in other regions was high. In the meantime, natural gas, which is one of the most important feedstock items in terms of

[35]http://www.mazidagi.gov.tr/default_B0.aspx?content=1010

[36] TUİK, 2011

fertilizer production, has been made available in the region and this has provided new means for production of sulphuric acid in the region.[37]

There would be work in 2 shifts at the stage of construction of the planned facility. 500 persons would be employed at the stage of construction. It is planned to employ 526 persons in 3 shifts at the operation stage.

Construction and installation Works would take approximately 63 months to be completed under the said Project and the operating life of the Project is envisaged as 50 years.

[37] Amber K., Demir A., Paça M. E., Mazıdağı Fosfat Tesisleri'nin Yeniden Ekonomiye Kazandırılmasına Yönelik Alternatif Yatırım İmkanları ve İşletme Modelleri (Alternative Investment Means and Operating Models for Revival of Mazıdağı Phosphate Facilities) , Dicle Kalkınma Ajansı (Tigris Development Agency), May 2010.

6.ENVIRONMENTAL IMPACTS

6.1. Topography and Soil

6.1.1.Phosphate Mine Sites

The raw material to be used in the INTEGRATED FERTILIZER PLANT planned to be materialized by the MAZIDAĞI DIVISION of ETİ BAKIR A.Ş. within the boundaries of Kocakent Village of Mazıdağı District within the province of Mardin of the Southeastern Anatolia Region is phosphate. The Group-IV licensed sites, the license numbers of which are İR-33838 and İR-83221, and the access numbers of which are 1153176 and 3307110, shall be utilized for the phosphate needs of the plant. The licensed surface area of the site with the license number İR-33838 is 8149.49 ha, while the annual quantity of phosphate intended to be obtained from this site is 1,730,000 tons; whereas the licensed surface area of the site with the license number İR-83221 is 15981.35 ha, while the annual quantity of phosphate intended to be obtained from this site is 400,000 tons.

In addition to the sites mentioned above, there is another licensed site within the boundaries of Çınar District within the province of Diyarbakır; however the utilization of this site within the scope of the intended project has not been scheduled.

The license filed coordinates are provided in the following table.

Table 30 The Coordinates of the Licensed Site No. İR-33838 and the Operating Permit

LICENSE FILED COORDINATES			
P. NO	**S. NO**	**Y**	**X**
1	1	610000	4148400
1	2	612720	4152120
1	3	616180	4153010
1	4	622430	4153880
1	5	622480	4145800
1	6	619750	4144141
1	7	613480	4146820
OPERATING PERMIT COORDINATES			
1	1	613000	4152160
1	2	616180	4153010
1	3	622430	4153880
1	4	622430	4150000
1	5	617000	4146000
1	6	613000	4150000

Table 31 The Coordinates of the Licensed Site No. İR-2783221 and the Operating Permit

LICENSE FILED COORDINATES			
P. NO	**S. NO**	**Y**	**X**
1	1	612200	4136100
1	2	612230	4143010
1	3	614940	4143960
1	4	619760	4144140
1	5	627140	4139680
1	6	634480	4141850
1	7	634170	4136710
1	8	631860	4131780
1	9	627400	4133520
1	10	627328	4135219
1	11	626440	4134480
1	12	624740	4134480
1	13	624500	4135580
1	14	623810	4135850
1	15	622900	4134350
1	16	621840	4135550
1	17	619570	4133830
1	18	618340	4134170
1	19	618210	4135000
1	20	617384	4136380
1	21	619000	4137780
1	22	625000	4135485
1	23	624438	4135829
1	24	625430	4137110
1	25	625400	4138000
1	26	624640	4138000
1	27	624431	4135829
1	28	624929	4135519
1	29	618125	4138125

The satellite image photo of the mine sites is given in **Annex-17**.

Open pit method shall be employed for the intended mining activities. The production shall be made in benches within the quarry area and the operation shall proceed through single benches. The height of each bench is planned to be 3.80 m. Rocks will be loosened by drilling and blasting for material extraction. The blasting pattern prepared for the production within the licensed site no. İR-33838 is given in the table below:

Table 32 Blasting Pattern for the Licensed Site no. İR-33838

AMOUNT OF ANNUAL PRODUCTION FROM THE MINE	1,730,000 TONS/YEAR	
Annual number of working days	260 days/year	
Monthly production amount	173.000 tons/month	
Amount obtained from each blasting	17,780 tons	
Daily production amount	6,650 tons/day	
Number and height of benches	Single bench	Bench height is designed to b 3.80 m
Thickness of material	3.50 m	
Density of material	2.50 ton/m^3	
Number of holes required for monthly production	1.400 holes	
Monthly number of blasting	10	
Number of holes to be blasted in each blasting	140	
Amount of material obtained from each hole	127 tons	
Quantity of explosives to be used in each hole	8.00 kg ANFO	0.50 kg dynamite
Hole length required for monthly production	5,320 m	
Hole-explosive charge rate	%60	
Hole stemming rate	%40	
Charge length required for monthly production	3,192 m	
Hole diameter	76 mm	
Hole length	3.5-4 m	
Monthly charge volume	14.00 m^3	
Tamped ANFO density	1.1 g/cm^3	
Monthly ANFO requirement	15.40 ton	

The blasting pattern prepared for the production within the licensed site no. İR-83221 is given in the table below.

Table 33 Blasting Pattern for the Licensed Site no. İR-33838

AMOUNT OF ANNUAL PRODUCTION FROM THE MINE	400,000 TONS/YEAR	
Annual number of working days	260 days/year	
Monthly production amount	40,000 tons/month	
Amount obtained from each blasting	12,700 ton	
Daily production amount	1,540 tons/day	
Number and height of benches	Single bench	Bench height is designed to b 3.80 m
Thickness of material	3.50 m	
Density of material	2.50 ton/m^3	
Number of holes required for monthly production	400 holes	
Monthly number of blasting	4	
Number of holes to be blasted in each blasting	100	
Amount of material obtained from each hole	110 ton	
Quantity of explosives to be used in each hole	8.00 kg ANFO	0.50 kg dynamite
Hole length required for monthly production	1,520 m	
Hole-explosive charge rate	%60	
Hole stemming rate	%40	
Charge length required for monthly production	912 m	
Hole diameter	76 mm	
Hole length	3.5-4 m	
Monthly charge volume	4.00 m^3	

Tamped ANFO density	1.1 g/cm^3	
Monthly ANFO requirement	4.40 ton	

Since production has been previously made in the site with the license İR-33838, no topsoil removal is necessary. It will be necessary for site with the license İR-83221.

Material obtained from the mining sites by means of drilling-blasting method shall be transported to the concentrator facility by trucks without being subjected to any process within the site. 7 trucks, 4 excavators, 1 dozer, and 1 rock machine shall be used for the production in the limestone quarry. As for stripping process, 20 trucks, 2 rock machines, 2 dozers, and 7 excavators shall be used. In addition to these machines, 1 roller, 1 grader and 1 sprinkler shall be used during the operations in the mine site. Licensed operators shall operate the vehicles within the quarry site, whereas nobody else shall be allowed in the quarry site, except employees in charge. About 80 personnel shall work for mining and transportation operations. These employees shall meet all their needs by means of existing facilities.

6.1.2. Phosphate Concentrator Facility

The phosphate concentrator facilities has already been erected and operated for a while. Therefore, there shall be no excavation necessary for it. In addition, the flue of the facility where drying process was conducted shall be shut down, so that there shall be no combustion gas emissions. Therefore, no adverse impacts of the facility are expected on the topography.

6.1.3. Integrated Fertilizer Facility

6.1.3.1. Construction Phase

The Integrated Fertilizer Facility to be erected within the scope of the project shall be deployed next to the existing Mazıdağı Phosphate Facilities. The existing phosphate beneficiation facilities (storage units, washing unit, drying unit) and the buildings like workshops, warehouse, dining hall, infirmary, laboratory, and administrative building and most of the infrastructural facilities are already available; so that excavation shall be necessary for these structures. However, stripping and foundation excavations shall be required for constructing phosphoric acid plant, acid storage tanks, sulfuric acid plant, wastewater treatment plant, ammonia plant, fertilizer plant, leaching field and loading sites.

These areas are illustrated in the following figure. In addition, the Layout Plan is given in **Annex-5**.

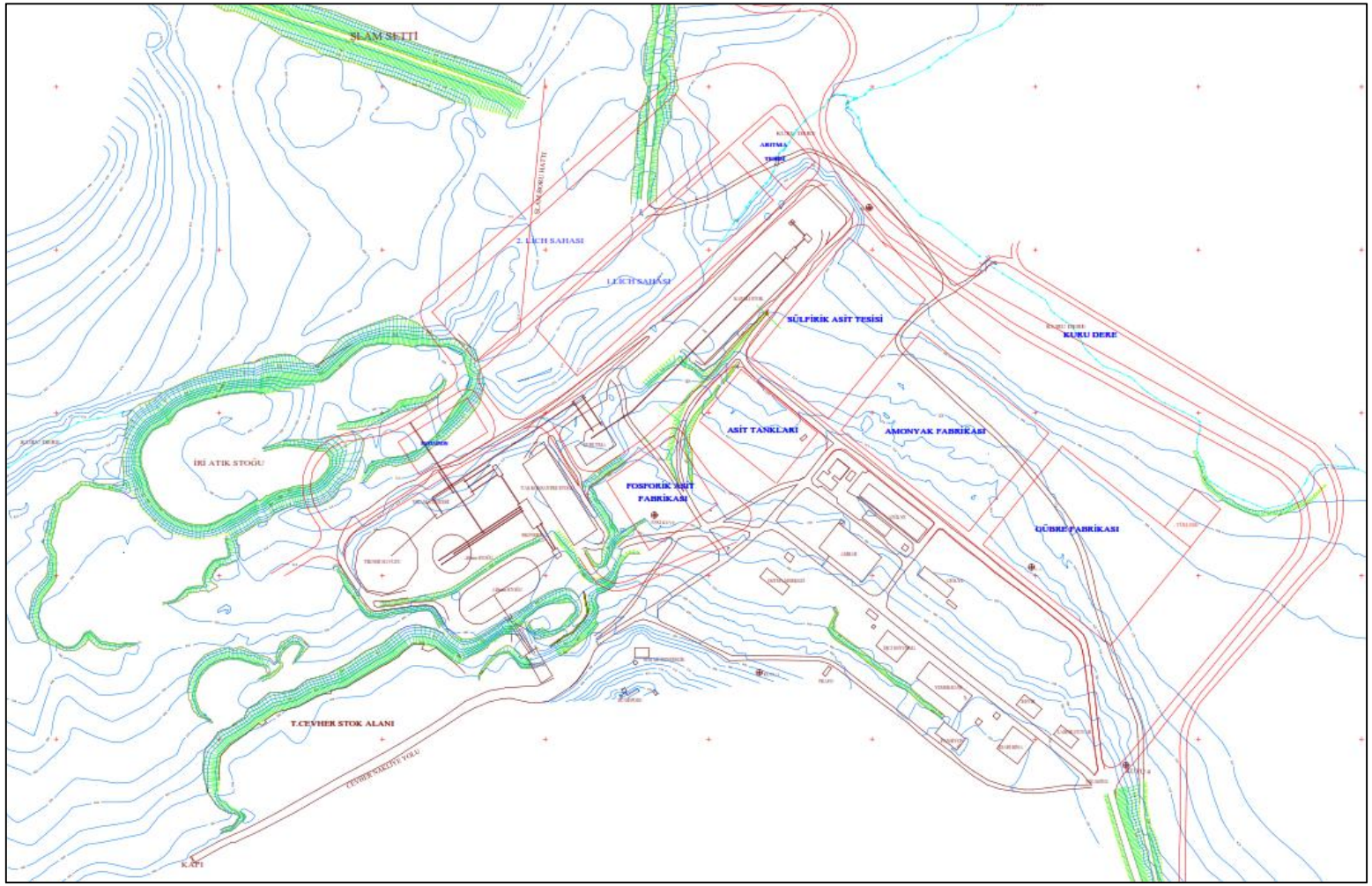


Figure 43 Layout Plan

An approximate volume of 850,000 m³ excavation shall be conducted within an area about 170,000 m² for the facilities to be erected within the scope of the project site.

The material extracted by excavations during the construction work within the scope of the project shall be re-used for backfilling.

In case of excavation waste generated within the project area, the provisions of the "*Regulation on Control of Excavation Soil and Construction and Demolition Waste*" promulgated in the Official Gazette issue no. 25406 on 18.03.2004 shall be complied with.

The excavation work within the project area shall be made for leveling the ground. Therefore, no storage shall be necessary, but the topsoil to be removed shall be stored in an appropriate place within the project area to be used for landscaping purposes.

Amount of excavation soil to be generated due to excavations for the facility units:

Every type of ground excavation = 850,000 m³

Density = 1.6 ton/m³

Amount of excavation soil to be generated = 850,000 m³ x 1.6 ton/m³ = 1,360,000 tons

6.1.3.2. Operation Phase

Soil Acidity

Soil acidification may be generally defined as increased acidity in soil. Soil acidification occurs, increasing soil acidity, depending on the density and contents of stack gas emissions stemming from industrial facilities in densely industrialized areas; this would also depend on the return of such emissions on to earth. The substances making the biggest contribution to soil acidification are sulphur compounds and nitrogen compounds which get into soil as a result of accumulation in the atmosphere. Nitrogen compounds have a part in acidification of soil when they are in excess of such volumes digestible by plants. SO_2 and NO_x joining water steam in the atmosphere cause acid rains. Acid rains react with minerals in soil, upsetting soil composition and also affecting soil chemical composition and biological conditions thereof. They wash away elements such as calcium and magnesium contained in soil composition, carrying them to the bottom water and causing soil to get poor and agricultural efficiency to decline.

Soil pH varies between 7.0 and 7.9 in the Southeastern Anatolian Regin where the Province of Mardin, which is the Project Site, is located and pH distribution by region in the Turkish territories is provided by the following table.

Table 34 pH 4 distribution by region in the Turkish territories [38]

REGION	NO OF SOILS ANALYZED	pH				
		4,0-4,9	**5,0-5,9**	**6,0-6,9**	**7,0-7,9**	**8,0-8,9**
Thrace and Marmara	8462	%9	%10,2	%30,7	%57,1	%1,1
Black Sea	10095	%4,7	%16,2	%25,4	%51,8	%1,9
Central Anatolia	25778	-	%0,7	%4,2	%89,7	%5,4
South East	**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
Turkey	64591	%9	%4,5		%76,5	%4,7

* *expressed as contained in pH saturation sludge*

Stack gas emissions will ocur in the facilities. The impacts on flora/fauna are because of these emissions. The impacts and quantity of chemical emissions can be changes according to several factors. The required mitigation measures will be conducted. Thjerefore, the emissions will not be affect to soil and vegetation a lot.

6.2. Emissions

6.2.1.Phosphate Mine Sites

a)Dust Emissions

In phosphate mine sites, dust will be occur during production and stripping phase.

Open pit method shall be employed as the production management in the phosphate sites of the project, whereas some dust shall be generated due to operating the mine and the ore beneficiation plant.

The activities which may cause dust during ore production:

- Blasting operations
- Material extraction by construction machinery
- Loading on trucks

[38] Bitki ve Toprağın Kimyasal Analizleri III: Toprak Analizleri, Ankara Üniversitesi Ziraat Fak. Eğitim, Araştırma ve Geliştirme Vakfı Yayınları No:3, Prof. Dr. Burhan Kaçar

- Transporting all-in ore to the beneficiation plant
- Unloading material to ore storage area

The activities which may cause dust during stripping extraction:

- Blasting operations
- Material extraction by construction machinery
- Loading on trucks
- Transportation to the storage area
- Unloading
- Storage

Dust Emissions of the Licensed Area No İR-33838

Dust Calculation for All-In Ore Production

Information regarding production capacities and working times of the phosphate quarry to be operated by means of open pit method are given in the following table.

Table 35 Information on Production within the Licensed Site No İR-33838

Annual Production Amount	Monthly Production Amount (10 months a year shall be worked)	Daily Production Amount (26 days a month shall be worked)	Hourly Production Amount (16 hours a day shall be worked)
1,730,000 ton	173,000 ton	6,653 ton	415.8 ton
692,000 m^{3*}	69,200 m^3	3,295,2 m^3	205.9 m^3

* Material density is 2.5 tons per m^3.

The amount of all-in ore extracted by each blasting operation shall be about 17,780 tons. 10 blasting operations per month and 140 holes to be blasted by each blasting operation are planned in order to achieve the annual capacity in line with the blasting design.

All-in phosphate removed by construction machinery after each blasting operation shall be loaded on trucks and transported to the ore beneficiation site which is 2,5 km away. Total daily amount of all-in ore to be extracted shall be 6,650 tons, while the capacity of each truck to be used for transportation shall be 85 tons. Thus, daily number of trips shall be about 79.

Table 36 Uncontrolled Emission Values of the Licensed Site no. İR-33838

Source of Dust	**Uncontrolled Emission Factor**	**Controlled Emission Flow Rates**	
Blasting	0.080	17,780 ton x 0.08 kg/ton	1,422.4 kg
Removal	0.025	415.8 ton/h x 0.025 kg/ton	10.395 kg/h
Loading	0.010	415.8 ton/h x 0.010 kg/ton	4.158 kg/h
Transportation	0.7	79 trips/ay x 0.7 kg/km-truck x 5 km (rund-trip) x 1day/16 h	17.28 kg/h
Unloading	0.010	415.8 ton/h x 0.010 kg/ton	4.158 kg/h
Total Emission Flow Rate			**35.99 kg/h**

Table 37 Controlled Emission Values of the Licensed Site no. İR-33838

Source of Dust	**Uncontrolled Emission Factor**	**Controlled Emission Flow Rates**	
Blasting	-	-	-
Removal	0.0125	415.8 ton/h x 0.0125 kg/ton	5.198 kg/h
Loading	0.005	415.8 ton/h x 0.005 kg/ton	2.079 kg/h
Transportation	0.35	79 trips/day x 0.35 kg/km-truck x 5 km (round-trip) x 1 day/16 h	8.64 kg/h
Unloading	0.005	415.8 ton/h x 0.005 kg/ton	2.079 kg/h
Total Emission Flow Rate			**17.99 kg/h**

Dust Modelling

General formulae used in dust modeling;

The Meteorological Bulletins of the province of Mardin for the periods 1970-2012 (Refer to **Annex-13)** have been used in dust modeling calculations.

Formulae II and III of the Environmental Legislation has been used for the dispersion modeling of dust to be generated.

Formula II of the Environmental Legislation (Griffort Dispersion)

$$C_i(x,y,z) = \frac{10^6}{3600*2®} * \frac{Q}{U_h *±_y *±_z} * \exp\left[-\frac{y^2}{2±_y^2}\right] * \left[\exp\left[\frac{-(z-h)^2}{2±_z^2}\right] + \left[\frac{-(z+h)^2}{2±_z^2}\right]\right] * \exp\left[-\sqrt{\frac{2}{®}} * \frac{V_{di}}{U_h} * \int_0^x \frac{1}{±_z(¶)} * \exp\left[\frac{h^2}{2±_z^2(¶)}\right] ¢¶\right]$$

Formula III of the Environmental Legislation

$$d(x,y) = 3600 \sum_{i=1}^{4} V_{di} * C_i(x,y,0)$$

Calculation of U_h *(wind speed)* value

$U_h=U_r(h/_{Za})^M$ formula is used.

h = Effective flue height

z_a = Height of anemometer from the ground in meters

The following values are taken of M.

Table 38 Dispersion categories

Dispersion category	M
A (very unstable)	0.09
B (unstable)	0.20
C/I (neutral)	0.22
C/II (neutral)	0.28
D (stable)	0.37
E (very stable)	0.42

Dust Modelling for İR 33838 Numbered Licenses Site No 33838 for Production

The residential area nearest to the project site is Karataş Village, which is about 700 m northeast.

For Controlled Emission;

Q = 17,99 kg/h → 80% of the dust to be generated during production is composed of particles bigger than 10µ (according to the experience).

For suspended particles C (x,y,z)

Q = 3,598 kg (for particles smaller than 10µ)

h = 20 m. (according to the experience)

z = 2 m.

V_{di} = 0,07 m/s

For Settled Amount of Dust (di)

Q = 14,39 kg (for particles bigger than 10µ)

h = 20 m. (according to the experience)

z = 0

V_{di} = 0,7 m/s

The following dust dispersion tables have been prepared by using the above values and formula.

Table 39 Dispersion of suspended particles based on distance for License No 33838 Production Phase (Controlled, µg/m^3)

U_a	U_R	U_h	100 m	250 m	500 m	1000 m	1500 m	2000 m	2500 m	3000 m
4,2	4,5	5,82	0,00	26,32	47,00	20,05	10,51	6,57	4,57	3,40
4,3	4,5	5,82	0,00	26,32	47,00	20,05	10,51	6,57	4,57	3,40
3,5	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,7	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,8	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,9	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
3,0	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,8	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,7	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,9	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,4	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,1	2	2,30	166,82	55,05	14,77	3,76	1,70	0,97	0,63	0,45
1,9	2	2,30	166,82	55,05	14,77	3,76	1,70	0,97	0,63	0,45
2,0	2	2,30	166,82	55,05	14,77	3,76	1,70	0,97	0,63	0,45
2,5	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
3,2	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81

Table 40 Dispersion Of Settled Dust Based On Distance For License No 33838 Production Phase (Controlled)

U_a	**U_R**	**U_h**	**100 m**	**250 m**	**500 m**	**1000 m**	**1500 m**	**2000 m**	**2500 m**	**3000 m**
4,2	4,5	5,82	62,96	5,67	2,44	1,37	1,01	0,81	0,68	0,59
4,3	4,5	5,82	62,96	5,67	2,44	1,37	1,01	0,81	0,68	0,59
3,5	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,7	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,8	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,9	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
3,0	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,8	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,7	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,9	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,4	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,1	2	2,30	164,83	14,54	6,20	3,48	2,56	2,06	1,72	1,48
1,9	2	2,30	164,83	14,54	6,20	3,48	2,56	2,06	1,72	1,48
2,0	2	2,30	164,83	14,54	6,20	3,48	2,56	2,06	1,72	1,48
2,5	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
3,2	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97

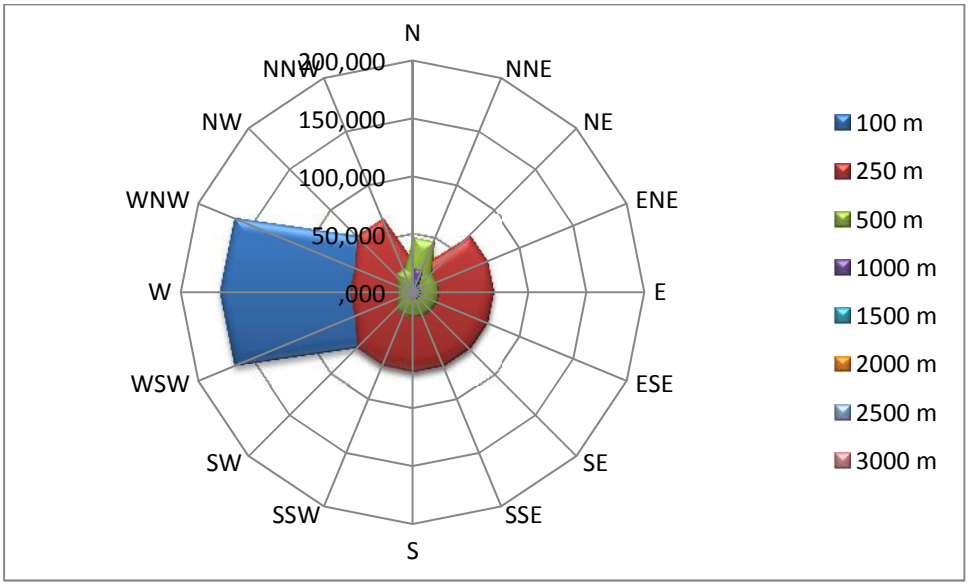


Figure 44 Dispersion of suspended particles based on distance for License No 33838 Production Phase (Controlled, µg/m^3)

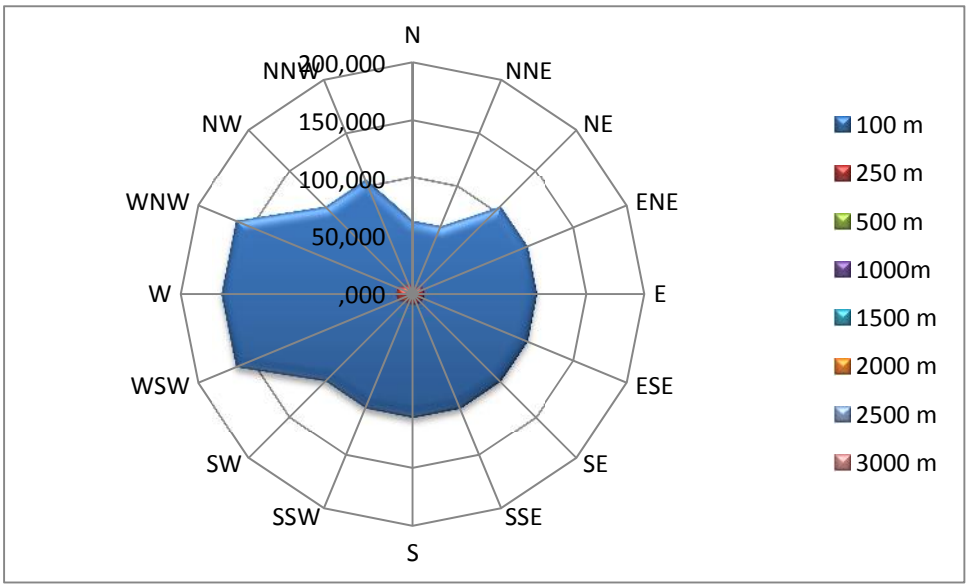


Figure 45 Dispersion Of Settled Dust Based On Distance For License No 33838 Production Phase (Controlled, mg/m^2-saat)

Uncontrolled emissions

Q = 35.99 kg/h → → 80% of the dust to be generated during production is composed of particles bigger than 10µ (according to the experience).

For suspended particles C (x,y,z)

Q = 7.198 kg (for particles smaller than 10µ)

h = 20 m. (according to the experience)

z = 2 m.

V_{di} = 0,07 m/s

For Settled Amount of Dust (di)

Q = 28.79 kg (for particles bigger than 10µ)

h = 20 m.

z = 0

V_{di} = 0,7 m/s

The following dust dispersion tables have been prepared by using the above values and formula.

Table 41 Dispersion of suspended particles based on distance for License No 33838 Production Phase (Uncontrolled, µg/m^3)

U_a	**U_R**	**U_h**	**100 m**	**250 m**	**500 m**	**1000 m**	**1500 m**	**2000 m**	**2500 m**	**3000 m**
4,2	4,5	5,82	0,00	52,65	94,02	40,11	21,02	13,15	9,15	6,80
4,3	4,5	5,82	0,00	52,65	94,02	40,11	21,02	13,15	9,15	6,80
3,5	3	3,49	136,77	137,72	43,55	11,89	5,59	3,31	2,23	1,62
2,7	3	3,49	136,77	137,72	43,55	11,89	5,59	3,31	2,23	1,62
2,8	3	3,49	136,77	137,72	43,55	11,89	5,59	3,31	2,23	1,62
2,9	3	3,49	136,77	137,72	43,55	11,89	5,59	3,31	2,23	1,62
3,0	3	3,49	136,77	137,72	43,55	11,89	5,59	3,31	2,23	1,62
2,8	3	3,49	136,77	137,72	43,55	11,89	5,59	3,31	2,23	1,62
2,7	3	3,49	136,77	137,72	43,55	11,89	5,59	3,31	2,23	1,62
2,9	3	3,49	136,77	137,72	43,55	11,89	5,59	3,31	2,23	1,62
2,4	3	3,49	136,77	137,72	43,55	11,89	5,59	3,31	2,23	1,62
2,1	2	2,30	333,73	110,12	29,55	7,53	3,40	1,95	1,27	0,90
1,9	2	2,30	333,73	110,12	29,55	7,53	3,40	1,95	1,27	0,90
2,0	2	2,30	333,73	110,12	29,55	7,53	3,40	1,95	1,27	0,90
2,5	3	3,49	136,77	137,72	43,55	11,89	5,59	3,31	2,23	1,62
3,2	3	3,49	136,77	137,72	43,55	11,89	5,59	3,31	2,23	1,62

Table 42 Dispersion Of Settled Dust Based On Distance For License No 33838 Production Phase (Uncontrolled, mg/m^2.gün)

U_a	U_R	U_h	100 m	250 m	500 m	1000 m	1500 m	2000 m	2500 m	3000 m
4,2	4,5	5,82	125,95	11,35	4,87	2,75	2,02	1,62	1,36	1,17
4,3	4,5	5,82	125,95	11,35	4,87	2,75	2,02	1,62	1,36	1,17
3,5	3	3,49	212,71	18,99	8,13	4,58	3,37	2,70	2,26	1,95
2,7	3	3,49	212,71	18,99	8,13	4,58	3,37	2,70	2,26	1,95
2,8	3	3,49	212,71	18,99	8,13	4,58	3,37	2,70	2,26	1,95
2,9	3	3,49	212,71	18,99	8,13	4,58	3,37	2,70	2,26	1,95
3,0	3	3,49	212,71	18,99	8,13	4,58	3,37	2,70	2,26	1,95
2,8	3	3,49	212,71	18,99	8,13	4,58	3,37	2,70	2,26	1,95
2,7	3	3,49	212,71	18,99	8,13	4,58	3,37	2,70	2,26	1,95
2,9	3	3,49	212,71	18,99	8,13	4,58	3,37	2,70	2,26	1,95
2,4	3	3,49	212,71	18,99	8,13	4,58	3,37	2,70	2,26	1,95
2,1	2	2,30	329,76	29,09	12,41	6,97	5,13	4,11	3,44	2,97
1,9	2	2,30	329,76	29,09	12,41	6,97	5,13	4,11	3,44	2,97
2,0	2	2,30	329,76	29,09	12,41	6,97	5,13	4,11	3,44	2,97
2,5	3	3,49	212,71	18,99	8,13	4,58	3,37	2,70	2,26	1,95
3,2	3	3,49	212,71	18,99	8,13	4,58	3,37	2,70	2,26	1,95

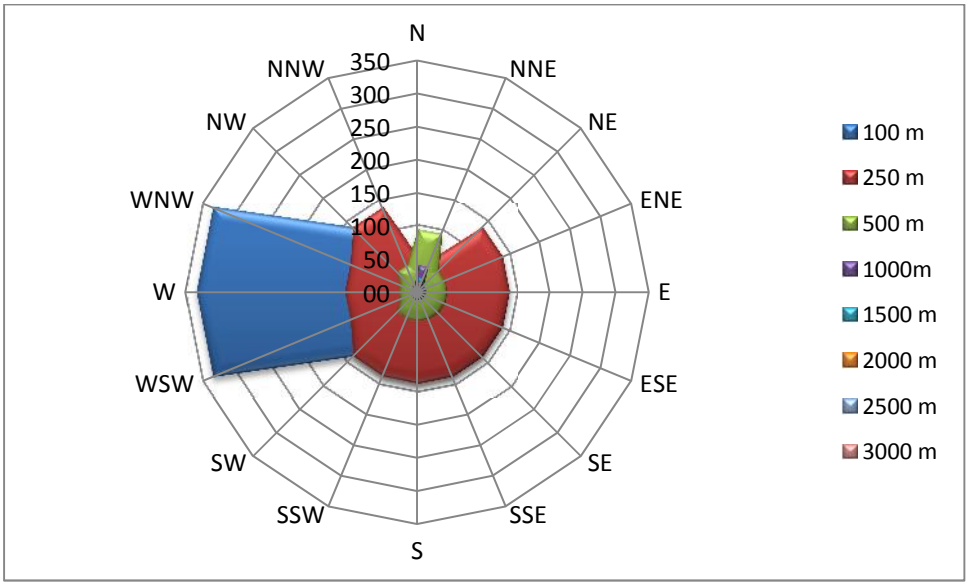


Figure 46 Dispersion of suspended particles based on distance for License No 33838 Production Phase (Uncontrolled, µg/m^3)

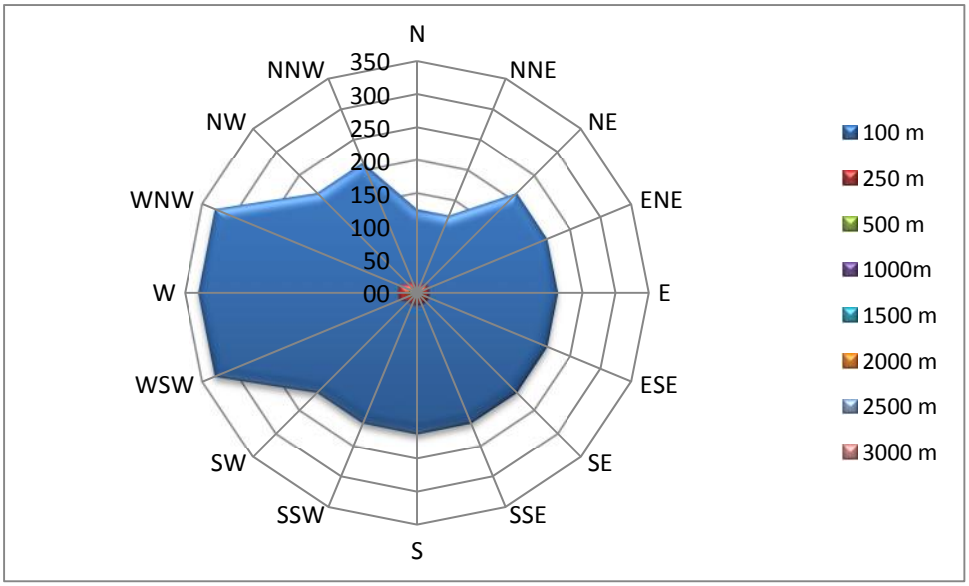


Figure 47 Dispersion Of Settled Dust Based On Distance For License No 33838 Production Phase (Uncontrolled, mg/m^2-saat)

Dust Calculation for Stripping

About 30-35% of the phosphate quarry to be operated by open pit method is all-in ore, whereas about 65-70% is stripping amount. Thus, the annual amount of all-in ore shall be 1,730,000 tons, while the annual amount of stripping shall be 3,593,000 tons. Information on stripping extraction capacity and working times is given in the following table.

Table 43 Information on Stripping of the Licensed Site no İR-33838

Annual Stripping Amount	Monthly Production Amount (10 months a year shall be worked)	Daily Production Amount (26 days a month shall be worked)	Hourly Production Amount (16 hours a day shall be worked)
3,593,000 ton	359,300 ton	13,819 ton	863.7 ton

The annual capacity of 3,593,000 tons mentioned above has been determined in accordance with the ore/stripping ratio of the reserves. The stripping released as the ore is extracted from the reserves shall be removed on a regular basis. However, the total figure has been estimated in proportion to annual working times. Accordingly, total daily amount of stripping to be extracted is 13,819 tons, whereas the capacity of each truck to be employed for transportation shall be 85 tons. Thus, daily number of trips shall be 163.

Table 44 Uncontrolled Emission Values of the Licensed Site no.İR-33838

Source of Dust	**Uncontrolled Emission Factor**	**Controlled Emission Flow Rates**	
Removal	0.025	863.7 ton/h x 0.025 kg/ton	21.59 kg/h
Loading	0.010	863.7 ton/h x 0.010 kg/ton	8.63 kg/h
Transportation	0.7	163 trips/day x 0.7 kg/km-truck x 5 km (round-trip) x 1 days /16 h	35.65 kg/h
Unloading	0.010	863.7 ton/h x 0.010 kg/ton	8.63 kg/h
Total Emission Flow Rate			74.5 kg/h

Table 45 Controlled Emission Values of the Licensed Site no İR-33838

Source of Dust	**Uncontrolled Emission Factor**	**Controlled Emission Flow Rates**	
Removal	0.0125	863.07 ton/hr x 0.0125 kg/ton	10.79 kg/hr
Loading	0.005	863.07 ton/hr x 0.005 kg/ton	4.32 kg/hr
Transportation	0.35	163 trips/day x 0.35 kg/km-truck x 5 km (round-trip) x 1 days /16 hr	17.83 kg/hr
Unloading	0.005	863.07 ton/hr x 0.005 kg/ton	4.32 kg/hr
Total Emission Flow Rate			**37.26 kg/hr**

Dust Modelling for İR 33838 Numbered Licenses Site No 33838 for Stripping

The residential area nearest to the project site is Karataş Village, which is about 700 m.

For Controlled Emission;

Q = 37,26 kg/h

For suspended particles C (x,y,z)

Q = 7,452 kg (for particles smaller than 10µ)

h = 20 m. (according to the experience)

z = 2 m.

V_{di} = 0,07 m/s

For Settled Amount of Dust (di)

Q = 29,808 kg (for particles bigger than 10µ)

h = 20 m.

z = 0

V_{di} = 0,7 m/s

The following dust dispersion tables have been prepared by using the above values and formula.

Table 46 Dispersion of suspended particles based on distance for License No 33838 Stripping Phase (Controlled, µg/m^3)

U_a	U_R	U_h	100 m	250 m	500 m	1000 m	1500 m	2000 m	2500 m	3000 m
4,2	4,5	5,82	0,00	54,51	97,33	41,52	21,76	13,62	9,47	7,05
4,3	4,5	5,82	0,00	54,51	97,33	41,52	21,76	13,62	9,47	7,05
3,5	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,7	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,8	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,9	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
3,0	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,8	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,7	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,9	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,4	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,1	2	2,30	345,51	114,01	30,60	7,80	3,52	2,01	1,31	0,93
1,9	2	2,30	345,51	114,01	30,60	7,80	3,52	2,01	1,31	0,93
2,0	2	2,30	345,51	114,01	30,60	7,80	3,52	2,01	1,31	0,93
2,5	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
3,2	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68

Table 47 Dispersion Of Settled Dust Based On Distance For License No 33838 Stripping Phase (Controlled)

U_a	**U_R**	**U_h**	**100 m**	**250 m**	**500 m**	**1000 m**	**1500 m**	**2000 m**	**2500 m**	**3000 m**
4,2	4,5	5,82	130,39	11,75	5,05	2,84	2,09	1,68	1,41	1,21
4,3	4,5	5,82	130,39	11,75	5,05	2,84	2,09	1,68	1,41	1,21
3,5	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,7	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,8	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,9	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
3,0	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,8	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,7	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,9	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,4	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,1	2	2,30	341,40	30,12	12,85	7,22	5,31	4,26	3,57	3,07
1,9	2	2,30	341,40	30,12	12,85	7,22	5,31	4,26	3,57	3,07
2,0	2	2,30	341,40	30,12	12,85	7,22	5,31	4,26	3,57	3,07
2,5	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
3,2	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02

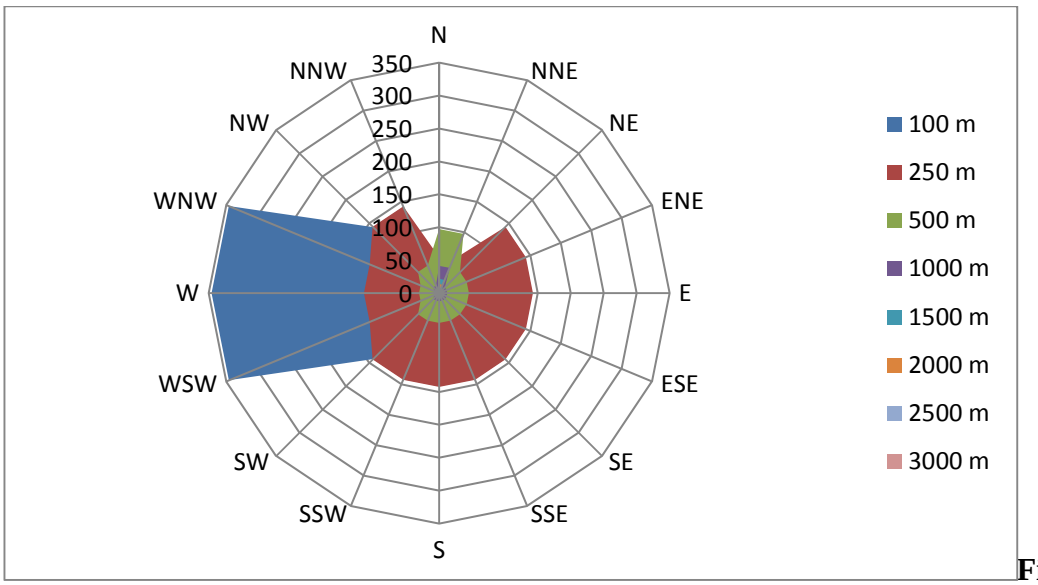


Figure 48 Dispersion of suspended particles based on distance for License No 33838 Stripping Phase (Controlled, µg/m^3)

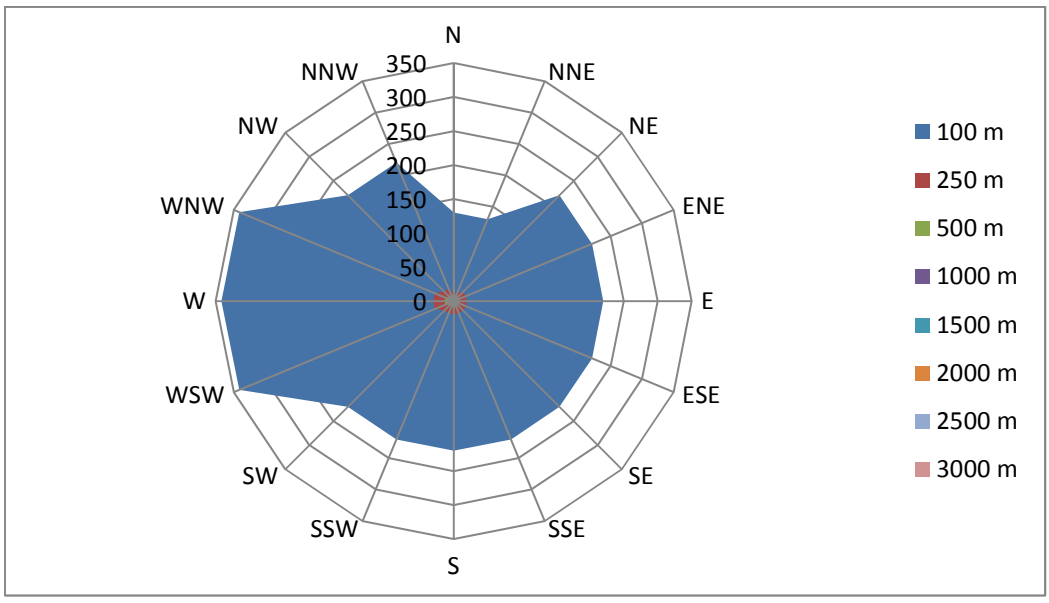


Figure 49 Dispersion of Settled Dust Based on Distance for License No 33838 Stripping Phase (Controlled, mg/m^2-saat)

Uncontrolled emissions

Q = 74.5 kg/saat

For suspended particles C (x,y,z)

Q = 14.9 kg

h = 20 m.

z = 2 m.

V_{di} = 0,07 m/s

For Settled Amount of Dust (di)

Q = 59.6 kg

h = 20 m.

z = 0

V_{di} = 0,7 m/s

The following dust dispersion tables have been prepared by using the above values and formula.

Table 48 Dispersion of suspended particles based on distance for License No 33838 Stripping Phase (Uncontrolled, µg/m^3)

U_a	U_R	U_h	100 m	250 m	500 m	1000 m	1500 m	2000 m	2500 m	3000 m
4,2	4,5	5,82	0,00	54,51	97,33	41,52	21,76	13,62	9,47	7,05
4,3	4,5	5,82	0,00	54,51	97,33	41,52	21,76	13,62	9,47	7,05
3,5	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,7	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,8	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,9	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
3,0	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,8	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,7	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,9	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,4	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
2,1	2	2,30	345,51	114,01	30,60	7,80	3,52	2,01	1,31	0,93
1,9	2	2,30	345,51	114,01	30,60	7,80	3,52	2,01	1,31	0,93
2,0	2	2,30	345,51	114,01	30,60	7,80	3,52	2,01	1,31	0,93
2,5	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68
3,2	3	3,49	141,59	142,58	45,08	12,31	5,79	3,43	2,30	1,68

Table 49 Dispersion Of Settled Dust Based On Distance For License No 33838 Stripping Phase (Uncontrolled)

U_a	U_R	U_h	100 m	250 m	500 m	1000 m	1500 m	2000 m	2500 m	3000 m
4,2	4,5	5,82	130,39	11,75	5,05	2,84	2,09	1,68	1,41	1,21
4,3	4,5	5,82	130,39	11,75	5,05	2,84	2,09	1,68	1,41	1,21
3,5	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,7	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,8	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,9	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
3,0	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,8	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,7	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,9	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,4	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
2,1	2	2,30	341,40	30,12	12,85	7,22	5,31	4,26	3,57	3,07
1,9	2	2,30	341,40	30,12	12,85	7,22	5,31	4,26	3,57	3,07
2,0	2	2,30	341,40	30,12	12,85	7,22	5,31	4,26	3,57	3,07
2,5	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02
3,2	3	3,49	220,22	19,66	8,42	4,74	3,49	2,80	2,34	2,02

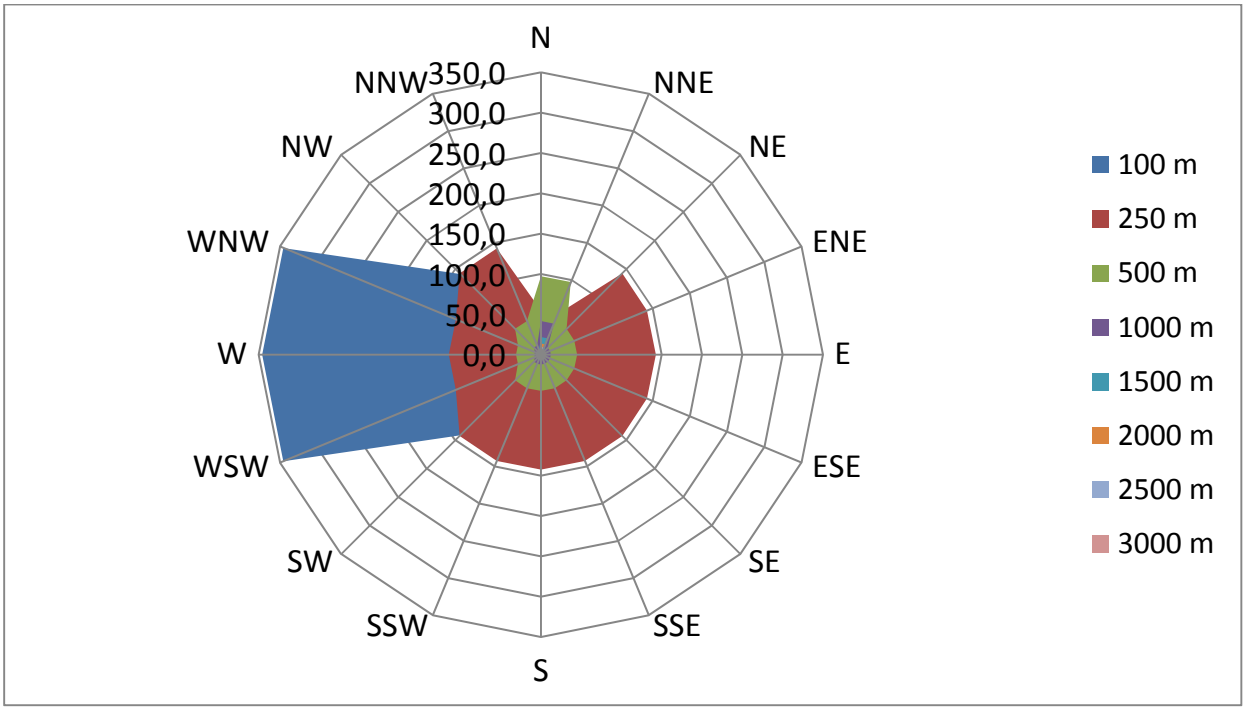


Figure 50 Dispersion of suspended particles based on distance for License No 33838 Stripping Phase (Uncontrolled, µg/m^3)

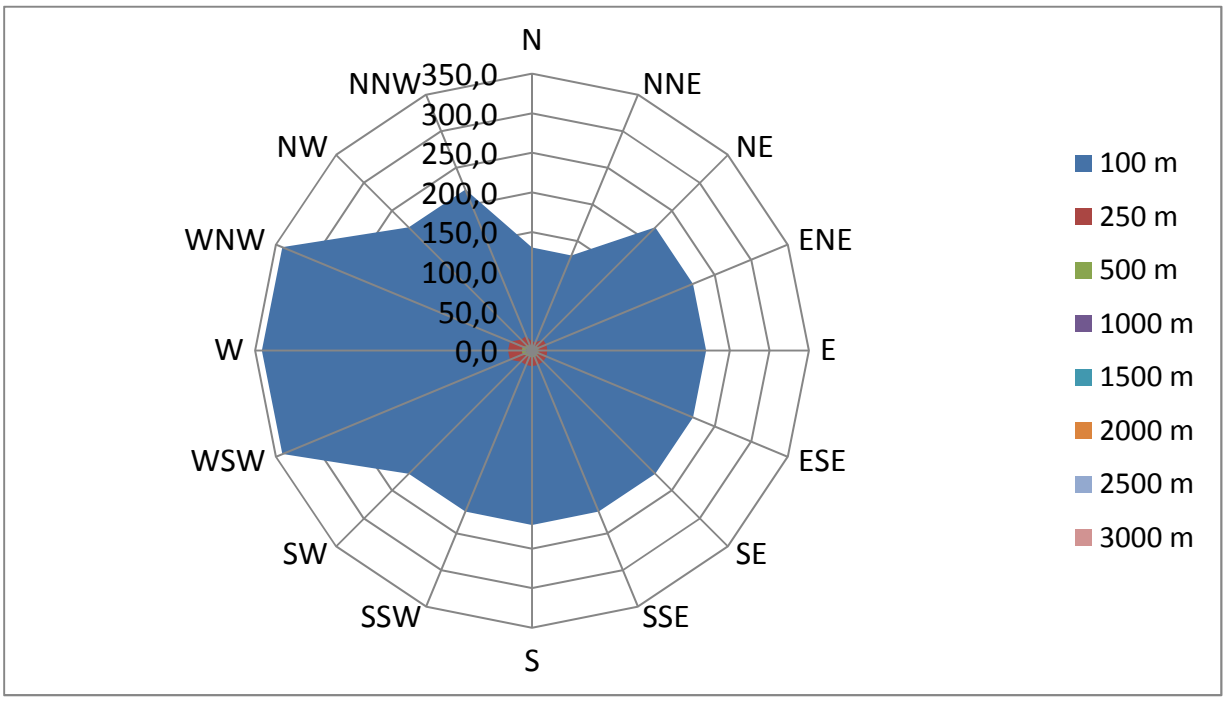


Figure 51 Dispersion Of Settled Dust Based On Distance For License No 33838 Stripping Phase (Uncontrolled, mg/m^2-saat)

Dust Emissions of the Licensed Area No İR-83221

Vegetable Soil Stripping

No production has taken place within the licensed site no. İR-83221. Thus, the topsoil within the site shall be stripped prior to the production. The topsoil shall be deposited in a proper area and protected from erosion, dehydration and weeds. It shall be covered by grasses, grassland plant, etc in order maintain its vitality. During the deposition of topsoil, the height of the vegetable soil shall not be more than 5 meters, while its slope shall not be more than 5%. The extracted vegetable soil shall be used for landscaping purposes. The surplus material shall be deposited temporarily separated from the excavation residuals within the area designated for excavation surplus materials. It shall be used for topography and land rehabilitation in compliance with the environment when the production is over.

Dust Calculation for All-In Ore Production

Information regarding production capacities and working times of the phosphate quarry to be operated by means of open pit method are given in the following table.

Table 50 Information on Production within the Licensed Site no. İR-83221

Annual Production Amount	Monthly Production Amount (10 months a year shall be worked)	Daily Production Amount (26 days a month shall be worked)	Hourly Production Amount (16 hours a day shall be worked)
400.000 ton	40.000 ton	1,538.5 ton	96.15 ton
160,000 m^{3*}	16.000 m^3	615.4 m^3	38.5 m^3

* Material density is 2.5 tons per m^3

The amount of all-in ore extracted by each blasting operation shall be about 11,000 tons. 4 blasting operations per month and 100 holes to be blasted by each blasting operation are planned in order to achieve the annual capacity in line with the blasting design.

All-in phosphate removed by construction machinery after each blasting operation shall be loaded on trucks and transported to the ore beneficiation site which is 15 km away in average. Total daily amount of all-in ore to be extracted shall be 1,538.5 tons, while the capacity of each truck to be used for transportation shall be 85 tons. Thus, daily number of trips shall be about 19.

Table 51 Uncontrolled Emission Values of the Licensed Site no. İR-83221

Source of Dust	**Uncontrolled Emission Factor**	**Controlled Emission Flow Rates**	
Blasting	0.080	11,000 ton x 0.08 kg/ton	880 kg
Removal	0.025	96.15 ton/hr x 0.025 kg/ton	2.40 kg/hr
Loading	0.010	96.15 ton/hr x 0.010 kg/ton	0.9615 kg/hr
Transportation	0.7	19 trips/day x 0.7 kg/km-truck x 30 km (round-trip) x 1 day/16 hr	24.9 kg/hr
Unloading	0.010	96.15 ton/hr x 0.010 kg/ton	0.9615 kg/hr
Toplam Emisyon Debisi			**29.223 kg/sa**

Table 52 Controlled Emission Values of the Licensed Site no. İR-83221

Source of Dust	**Uncontrolled Emission Factor**	**Controlled Emission Flow Rates**	
Blasting	-	-	-
Removal	0.0125	96.15 ton/hr x 0.0125 kg/ton	1.20 kg/hr
Loading	0.005	96.15 ton/hr x 0.005 kg/ton	0.48 kg/hr
Transportation	0.35	19 trips/day x 0.35 kg/km-truck x 30 km (round-trip) x 1 day/16 hr	12.5 kg/hr
Unloading	0.005	96.15 ton/hr x 0.005 kg/ton	0.48 kg/hr
Total Emission Flow Rate			**14.66 kg/hr**

Dust Modelling for İR 83221 Numbered Licenses Site for Production

There are several residentals in the close vicinity of mine site. It has been assumed that the closest residentals are 500 m far away and the calculations have been conducted according to this assumption.

For Controlled Emission;

Q = 14.66 kg/h

For suspended particles C (x,y,z)

Q = 2.932 kg

h = 20 m.

z = 2 m.

V_{di} = 0,07 m/s

For Settled Amount of Dust (di)

Q = 11,728 kg

h = 20 m.

z = 0

V_{di} = 0,7 m/s

The following dust dispersion tables have been prepared by using the above values and formula.

Table 53 Dispersion of suspended particles based on distance for License No 83221 Production Phase (Controlled, µg/m^3)

U_a	U_R	U_h	100 m	250 m	500 m	1000 m	1500 m	2000 m	2500 m	3000 m
4,2	4,5	5,82	0,00	26,32	47,00	20,05	10,51	6,57	4,57	3,40
4,3	4,5	5,82	0,00	26,32	47,00	20,05	10,51	6,57	4,57	3,40
3,5	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,7	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,8	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,9	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
3,0	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,8	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,7	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,9	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,4	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
2,1	2	2,30	166,82	55,05	14,77	3,76	1,70	0,97	0,63	0,45
1,9	2	2,30	166,82	55,05	14,77	3,76	1,70	0,97	0,63	0,45
2,0	2	2,30	166,82	55,05	14,77	3,76	1,70	0,97	0,63	0,45
2,5	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81
3,2	3	3,49	68,37	68,84	21,77	5,94	2,79	1,65	1,11	0,81

Table 54 Dispersion of settled dust based on distance for License No 83221 Production Phase (Controlled, mg/m^2.gün)

U_a	**U_R**	**U_h**	**100 m**	**250 m**	**500 m**	**1000 m**	**1500 m**	**2000 m**	**2500 m**	**3000 m**
4,2	4,5	5,82	62,96	5,67	2,44	1,37	1,01	0,81	0,68	0,59
4,3	4,5	5,82	62,96	5,67	2,44	1,37	1,01	0,81	0,68	0,59
3,5	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,7	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,8	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,9	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
3,0	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,8	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,7	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,9	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,4	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
2,1	2	2,30	164,83	14,54	6,20	3,48	2,56	2,06	1,72	1,48
1,9	2	2,30	164,83	14,54	6,20	3,48	2,56	2,06	1,72	1,48
2,0	2	2,30	164,83	14,54	6,20	3,48	2,56	2,06	1,72	1,48
2,5	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97
3,2	3	3,49	106,33	9,49	4,06	2,29	1,68	1,35	1,13	0,97

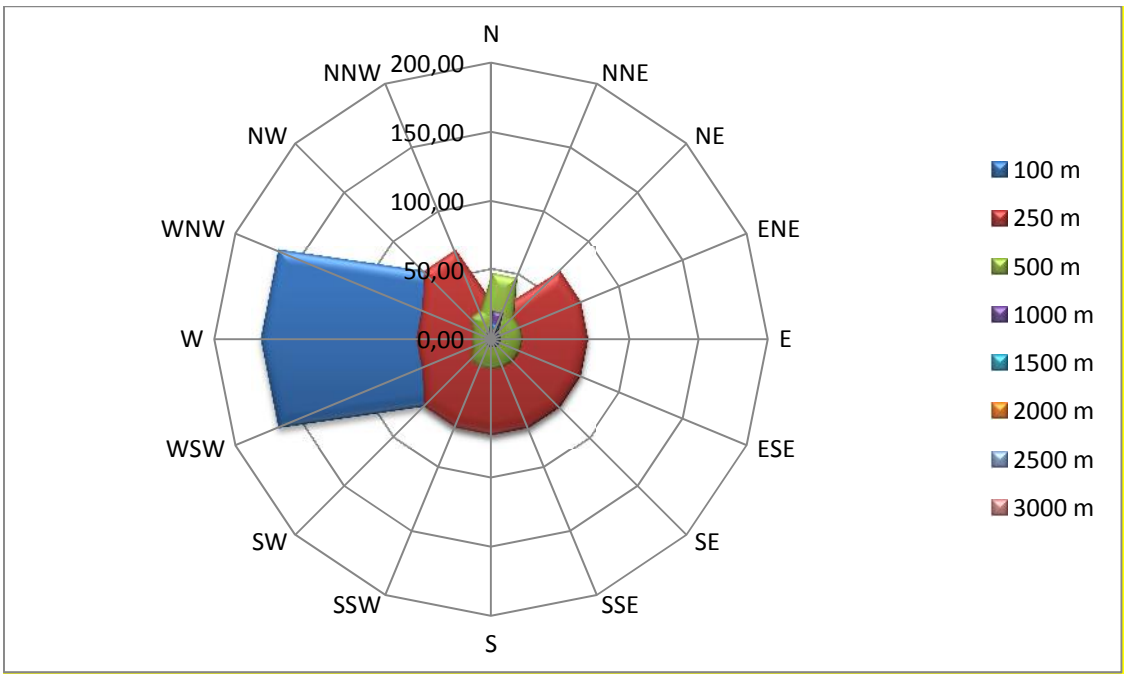


Figure 52 Dispersion of suspended particles based on distance for License No 83221 Production Phase (Controlled, µg/m^3)

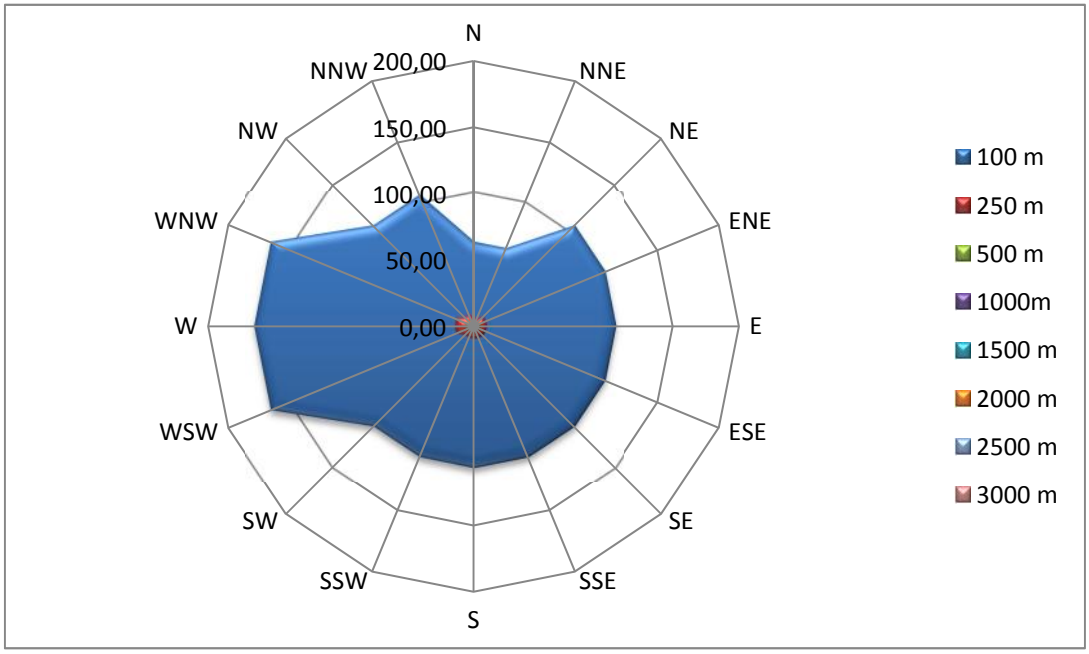


Figure 53 Dispersion of settled dust based on distance for License No 83221 Production Phase (Controlled, mg/m^2.gün)

Uncontrolled emissions

Q = 29.223 kg/h

For suspended particles C (x,y,z)

Q = 5.84 kg

h = 20 m.

z = 2 m.

V_{di} = 0,07 m/s

For Settled Amount of Dust (di)

Q = 23.38 kg

h = 20 m.

z = 0

V_{di} = 0,7 m/s

The following dust dispersion tables have been prepared by using the above values and formula.

Table 55 Dispersion of suspended particles based on distance for License No 83221 Production Phase (Uncontrolled, µg/m^3)

U_a	**U_R**	**U_h**	**100 m**	**250 m**	**500 m**	**1000 m**	**1500 m**	**2000 m**	**2500 m**	**3000 m**
4,2	4,5	5,82	0,00	42,75	76,33	32,56	17,07	10,68	7,43	5,52
4,3	4,5	5,82	0,00	42,75	76,33	32,56	17,07	10,68	7,43	5,52
3,5	3	3,49	111,04	111,81	35,36	9,65	4,54	2,69	1,81	1,31
2,7	3	3,49	111,04	111,81	35,36	9,65	4,54	2,69	1,81	1,31
2,8	3	3,49	111,04	111,81	35,36	9,65	4,54	2,69	1,81	1,31
2,9	3	3,49	111,04	111,81	35,36	9,65	4,54	2,69	1,81	1,31
3,0	3	3,49	111,04	111,81	35,36	9,65	4,54	2,69	1,81	1,31
2,8	3	3,49	111,04	111,81	35,36	9,65	4,54	2,69	1,81	1,31
2,7	3	3,49	111,04	111,81	35,36	9,65	4,54	2,69	1,81	1,31
2,9	3	3,49	111,04	111,81	35,36	9,65	4,54	2,69	1,81	1,31
2,4	3	3,49	111,04	111,81	35,36	9,65	4,54	2,69	1,81	1,31
2,1	2	2,30	270,96	89,41	23,99	6,11	2,76	1,58	1,03	0,73
1,9	2	2,30	270,96	89,41	23,99	6,11	2,76	1,58	1,03	0,73
2,0	2	2,30	270,96	89,41	23,99	6,11	2,76	1,58	1,03	0,73
2,5	3	3,49	111,04	111,81	35,36	9,65	4,54	2,69	1,81	1,31
3,2	3	3,49	111,04	111,81	35,36	9,65	4,54	2,69	1,81	1,31

Table 56 Dispersion of settled dust based on distance for License No 83221 Production Phase (Uncontrolled, $\mu g/m^3$)

U_a	**U_R**	**U_h**	**100 m**	**250 m**	**500 m**	**1000 m**	**1500 m**	**2000 m**	**2500 m**	**3000 m**
4,2	4,5	5,82	102,26	9,21	3,96	2,23	1,64	1,32	1,10	0,95
4,3	4,5	5,82	102,26	9,21	3,96	2,23	1,64	1,32	1,10	0,95
3,5	3	3,49	172,70	15,42	6,60	3,72	2,74	2,19	1,84	1,58
2,7	3	3,49	172,70	15,42	6,60	3,72	2,74	2,19	1,84	1,58
2,8	3	3,49	172,70	15,42	6,60	3,72	2,74	2,19	1,84	1,58
2,9	3	3,49	172,70	15,42	6,60	3,72	2,74	2,19	1,84	1,58
3,0	3	3,49	172,70	15,42	6,60	3,72	2,74	2,19	1,84	1,58
2,8	3	3,49	172,70	15,42	6,60	3,72	2,74	2,19	1,84	1,58
2,7	3	3,49	172,70	15,42	6,60	3,72	2,74	2,19	1,84	1,58
2,9	3	3,49	172,70	15,42	6,60	3,72	2,74	2,19	1,84	1,58
2,4	3	3,49	172,70	15,42	6,60	3,72	2,74	2,19	1,84	1,58
2,1	2	2,30	267,73	23,62	10,07	5,66	4,16	3,34	2,80	2,41
1,9	2	2,30	267,73	23,62	10,07	5,66	4,16	3,34	2,80	2,41
2,0	2	2,30	267,73	23,62	10,07	5,66	4,16	3,34	2,80	2,41
2,5	3	3,49	172,70	15,42	6,60	3,72	2,74	2,19	1,84	1,58
3,2	3	3,49	172,70	15,42	6,60	3,72	2,74	2,19	1,84	1,58

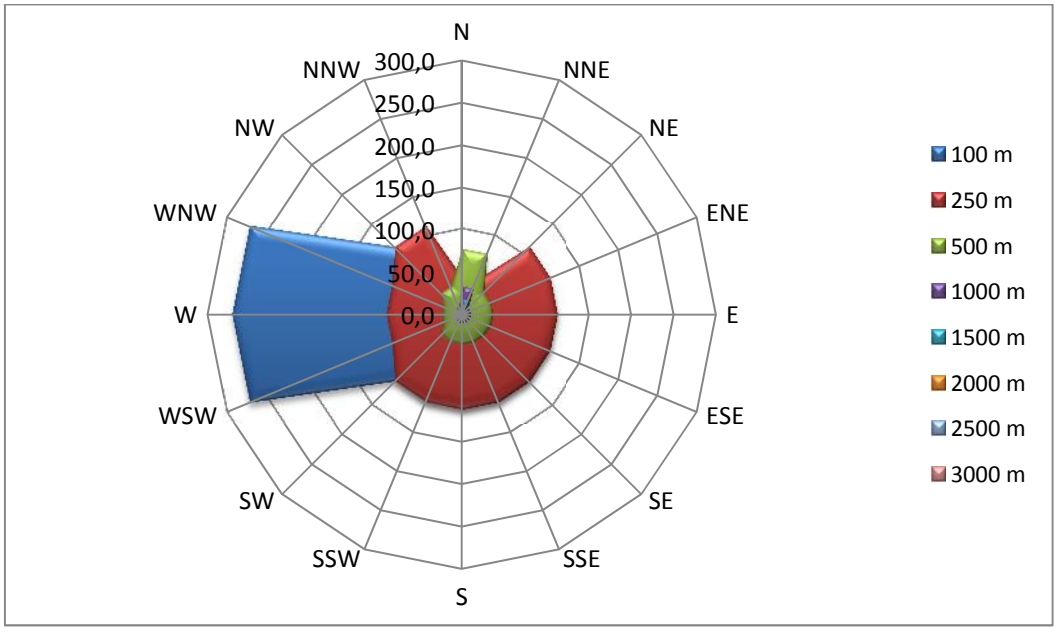


Figure 54 Dispersion of suspended particles based on distance for License No 83221 Production Phase (Uncontrolled, µg/m^3)

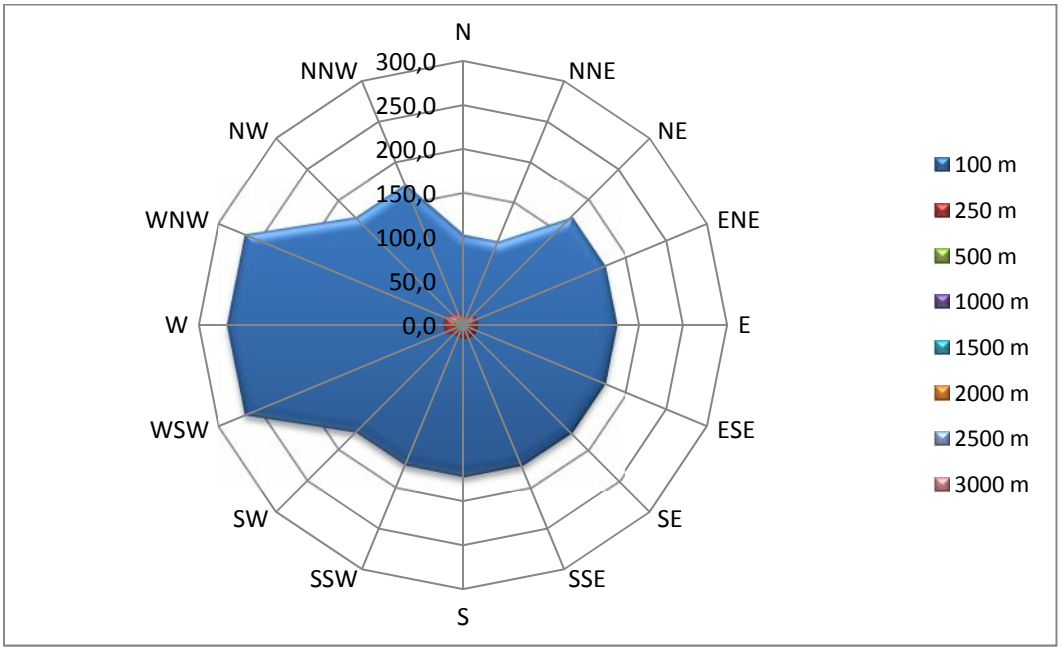


Figure 55 Dispersion of settled dust based on distance for License No 83221 Production Phase (Uncontrolled, mg/m^2-saat)

Dust Calculation for Stripping Extraction

About 30-35% of the phosphate quarry to be operated by open pit method is all-in ore, whereas about 65-70% is stripping amount. Thus, the annual amount of all-in ore shall be 400,000 tons, while the annual amount of stripping shall be 743,000 tons. Information on stripping extraction capacity and working times is given in the following table.

Table 57 Information on Stripping of the Licensed Site no. İR-83221

Annual Stripping Amount	Monthly Production Amount (10 months a year shall be worked)	Daily Production Amount (26 days a month shall be worked)	Hourly Production Amount (16 hours a day shall be worked)
743.000 ton	74.300 ton	2,857.6 ton	178.6 ton

The annual capacity of 743,000 tons mentioned above has been determined in accordance with the ore/stripping ratio of the reserves. The stripping released as the ore is extracted from the reserves shall be removed on a regular basis. However, the total figure has been estimated in proportion to annual working times. Accordingly, total daily amount of stripping to be extracted is 2,857.6 tons, whereas the capacity of each truck to be employed for transportation shall be 85 tons. Thus, daily number of trips shall be 34.

Table 58 Uncontrolled Emission Values of the Licensed Site no. İR 83221

Source of Dust	**Uncontrolled Emission Factor**	**Controlled Emission Flow Rates**	
Removal	0.025	178.6 ton/hr x 0.025 kg/ton	4.46 kg/hr
Loading	0.010	178.6 ton/hr x 0.010 kg/ton	1.786 kg/hr
Transportation	0.7	34 trips/day x 0.7 kg/km-truck x 30 km (round-trip) x 1 days /16 hr	44.6 kg/hr
Unloading	0.010	178.6 ton/hr x 0.010 kg/ton	1.786 kg/hr
Total Emission Flow Rate			**52.63 kg/hr**

Table 59 Controlled Emission Values of the Licensed Site no. İR-83221

Source of Dust	**Uncontrolled Emission Factor**	**Controlled Emission Flow Rates**	
Removal	0.0125	178.6 ton/hr x 0.0125 kg/ton	2.23 kg/hr
Loading	0.005	178.6 ton/hr x 0.005 kg/ton	0.893 kg/hr
Transportation	0.35	34 trips/day x 0.35 kg/km-truck x 30 km (round-trip) x 1 days /16 hr	22.31 kg/hr
Unloading	0.005	178.6 ton/hr x 0.005 kg/ton	0.893 kg/hr
Total Emission Flow Rate			**26.32 kg/hr**

Dust Modelling for Stripping Numbered Licenses Site No 83221

For Controlled Emission;

Q = 26.32 kg/h

For suspended particles C (x,y,z)

Q = 5.264 kg

h = 20 m.

z = 2 m.

V_{di} = 0,07 m/s

For Settled Amount of Dust (di)

Q = 21.056 kg

h = 20 m.

z = 0

V_{di} = 0,7 m/s

The following dust dispersion tables have been prepared by using the above values and formula.

Table 60 Dispersion of suspended particles based on distance for License No 83221 Stripping Phase (Controlled, µg/m^3)

U_a	**U_R**	**U_h**	**100 m**	**250 m**	**500 m**	**1000 m**	**1500 m**	**2000 m**	**2500 m**	**3000 m**
4,2	4,5	5,82	0,00	38,51	68,76	29,33	15,37	9,62	6,69	4,98
4,3	4,5	5,82	0,00	38,51	68,76	29,33	15,37	9,62	6,69	4,98
3,5	3	3,49	100,02	100,71	31,85	8,70	4,09	2,42	1,63	1,18
2,7	3	3,49	100,02	100,71	31,85	8,70	4,09	2,42	1,63	1,18
2,8	3	3,49	100,02	100,71	31,85	8,70	4,09	2,42	1,63	1,18
2,9	3	3,49	100,02	100,71	31,85	8,70	4,09	2,42	1,63	1,18
3,0	3	3,49	100,02	100,71	31,85	8,70	4,09	2,42	1,63	1,18
2,8	3	3,49	100,02	100,71	31,85	8,70	4,09	2,42	1,63	1,18
2,7	3	3,49	100,02	100,71	31,85	8,70	4,09	2,42	1,63	1,18
2,9	3	3,49	100,02	100,71	31,85	8,70	4,09	2,42	1,63	1,18
2,4	3	3,49	100,02	100,71	31,85	8,70	4,09	2,42	1,63	1,18
2,1	2	2,30	244,06	80,54	21,61	5,51	2,49	1,42	0,93	0,65
1,9	2	2,30	244,06	80,54	21,61	5,51	2,49	1,42	0,93	0,65
2,0	2	2,30	244,06	80,54	21,61	5,51	2,49	1,42	0,93	0,65
2,5	3	3,49	100,02	100,71	31,85	8,70	4,09	2,42	1,63	1,18
3,2	3	3,49	100,02	100,71	31,85	8,70	4,09	2,42	1,63	1,18

Table 61 Dispersion of settled dust based on distance for License No 83221 Stripping Phase (Controlled, mg/m^2.gün)

U_a	U_R	U_h	100 m	250 m	500 m	1000 m	1500 m	2000 m	2500 m	3000 m
4,2	4,5	5,82	92,11	8,30	3,56	2,01	1,48	1,19	0,99	0,86
4,3	4,5	5,82	92,11	8,30	3,56	2,01	1,48	1,19	0,99	0,86
3,5	3	3,49	155,56	13,89	5,95	3,35	2,46	1,98	1,66	1,43
2,7	3	3,49	155,56	13,89	5,95	3,35	2,46	1,98	1,66	1,43
2,8	3	3,49	155,56	13,89	5,95	3,35	2,46	1,98	1,66	1,43
2,9	3	3,49	155,56	13,89	5,95	3,35	2,46	1,98	1,66	1,43
3,0	3	3,49	155,56	13,89	5,95	3,35	2,46	1,98	1,66	1,43
2,8	3	3,49	155,56	13,89	5,95	3,35	2,46	1,98	1,66	1,43
2,7	3	3,49	155,56	13,89	5,95	3,35	2,46	1,98	1,66	1,43
2,9	3	3,49	155,56	13,89	5,95	3,35	2,46	1,98	1,66	1,43
2,4	3	3,49	155,56	13,89	5,95	3,35	2,46	1,98	1,66	1,43
2,1	2	2,30	241,16	21,27	9,07	5,10	3,75	3,01	2,52	2,17
1,9	2	2,30	241,16	21,27	9,07	5,10	3,75	3,01	2,52	2,17
2,0	2	2,30	241,16	21,27	9,07	5,10	3,75	3,01	2,52	2,17
2,5	3	3,49	155,56	13,89	5,95	3,35	2,46	1,98	1,66	1,43
3,2	3	3,49	155,56	13,89	5,95	3,35	2,46	1,98	1,66	1,43

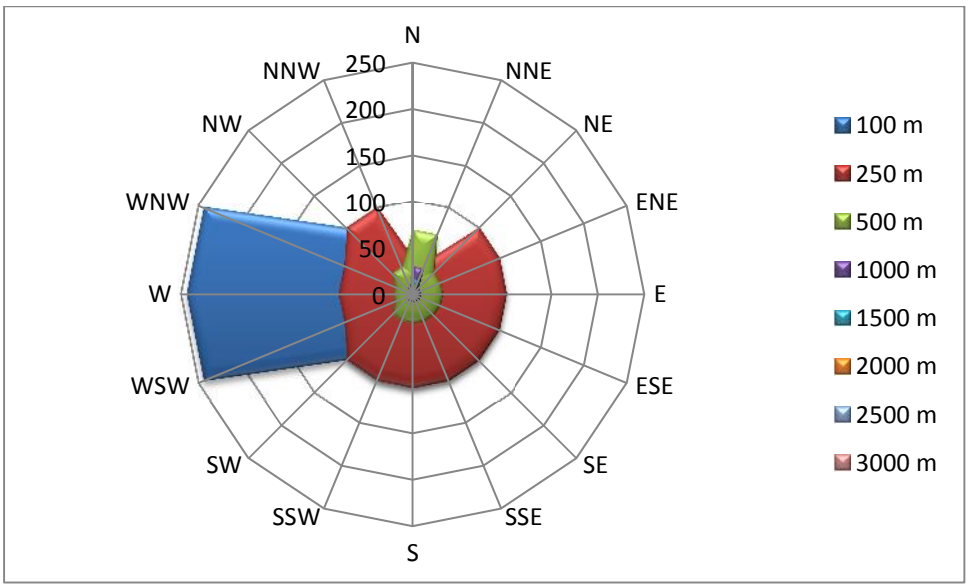


Figure 56 Dispersion of suspended particles based on distance for License No 83221 Stripping Phase (Controlled, µg/m^3)

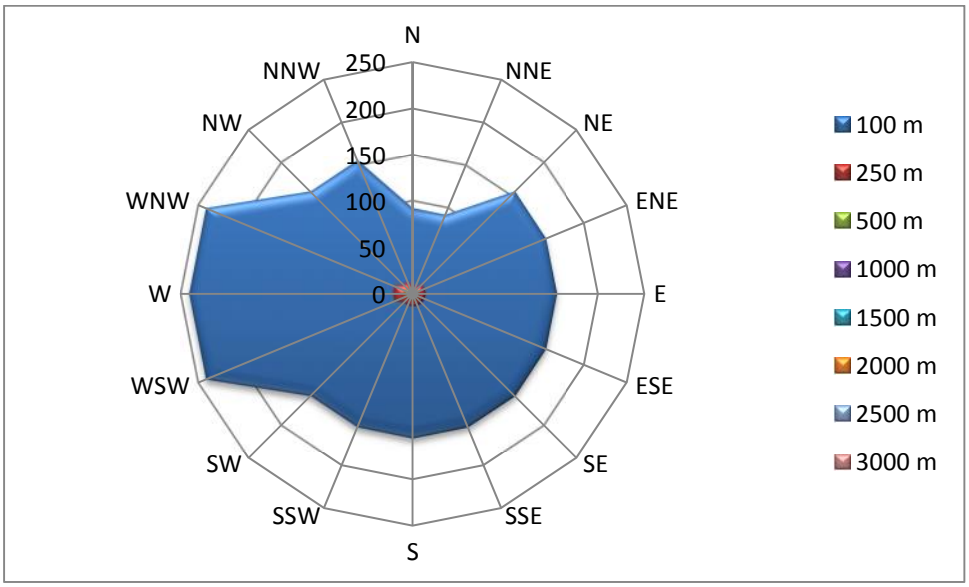


Figure 57 Dispersion of settled dust based on distance for License No 83221 Stripping Phase (Controlled, mg/m^2-saat)

For Uncontrolled Emission;

Q = 52.63 kg/h

For suspended particles C (x,y,z)

Q = 10.526 kg

h = 20 m.

z = 2 m.

V_{di} = 0,07 m/s

For Settled Amount of Dust (di)

Q = 42.104 kg

h = 20 m.

z = 0

V_{di} = 0,7 m/s

The following dust dispersion tables have been prepared by using the above values and formula.

Table 62 Dispersion of suspended particles based on distance for License No 83221 Stripping Phase (Uncontrolled, µg/m^3)

U_a	U_R	U_h	100 m	250 m	500 m	1000 m	1500 m	2000 m	2500 m	3000 m
4,2	4,5	5,82	0,00	77,00	137,48	58,65	30,74	19,23	13,38	9,95
4,3	4,5	5,82	0,00	77,00	137,48	58,65	30,74	19,23	13,38	9,95
3,5	3	3,49	200,00	201,39	63,68	17,39	8,17	4,84	3,25	2,37
2,7	3	3,49	200,00	201,39	63,68	17,39	8,17	4,84	3,25	2,37
2,8	3	3,49	200,00	201,39	63,68	17,39	8,17	4,84	3,25	2,37
2,9	3	3,49	200,00	201,39	63,68	17,39	8,17	4,84	3,25	2,37
3,0	3	3,49	200,00	201,39	63,68	17,39	8,17	4,84	3,25	2,37
2,8	3	3,49	200,00	201,39	63,68	17,39	8,17	4,84	3,25	2,37
2,7	3	3,49	200,00	201,39	63,68	17,39	8,17	4,84	3,25	2,37
2,9	3	3,49	200,00	201,39	63,68	17,39	8,17	4,84	3,25	2,37
2,4	3	3,49	200,00	201,39	63,68	17,39	8,17	4,84	3,25	2,37
2,1	2	2,30	488,04	161,04	43,22	11,01	4,97	2,84	1,85	1,31
1,9	2	2,30	488,04	161,04	43,22	11,01	4,97	2,84	1,85	1,31
2,0	2	2,30	488,04	161,04	43,22	11,01	4,97	2,84	1,85	1,31
2,5	3	3,49	200,00	201,39	63,68	17,39	8,17	4,84	3,25	2,37
3,2	3	3,49	200,00	201,39	63,68	17,39	8,17	4,84	3,25	2,37

Table 63 Dispersion of settled dust based on distance for License No 83221 Stripping Phase (Uncontrolled, mg/m^2.gün)

U_a	U_R	U_h	100 m	250 m	500 m	1000 m	1500 m	2000 m	2500 m	3000 m
4,2	4,5	5,82	184,18	16,59	7,13	4,02	2,96	2,37	1,99	1,71
4,3	4,5	5,82	184,18	16,59	7,13	4,02	2,96	2,37	1,99	1,71
3,5	3	3,49	311,06	27,77	11,89	6,69	4,93	3,95	3,31	2,85
2,7	3	3,49	311,06	27,77	11,89	6,69	4,93	3,95	3,31	2,85
2,8	3	3,49	311,06	27,77	11,89	6,69	4,93	3,95	3,31	2,85
2,9	3	3,49	311,06	27,77	11,89	6,69	4,93	3,95	3,31	2,85
3,0	3	3,49	311,06	27,77	11,89	6,69	4,93	3,95	3,31	2,85
2,8	3	3,49	311,06	27,77	11,89	6,69	4,93	3,95	3,31	2,85
2,7	3	3,49	311,06	27,77	11,89	6,69	4,93	3,95	3,31	2,85
2,9	3	3,49	311,06	27,77	11,89	6,69	4,93	3,95	3,31	2,85
2,4	3	3,49	311,06	27,77	11,89	6,69	4,93	3,95	3,31	2,85
2,1	2	2,30	482,22	42,54	18,15	10,20	7,50	6,01	5,04	4,34
1,9	2	2,30	482,22	42,54	18,15	10,20	7,50	6,01	5,04	4,34
2,0	2	2,30	482,22	42,54	18,15	10,20	7,50	6,01	5,04	4,34
2,5	3	3,49	311,06	27,77	11,89	6,69	4,93	3,95	3,31	2,85
3,2	3	3,49	311,06	27,77	11,89	6,69	4,93	3,95	3,31	2,85

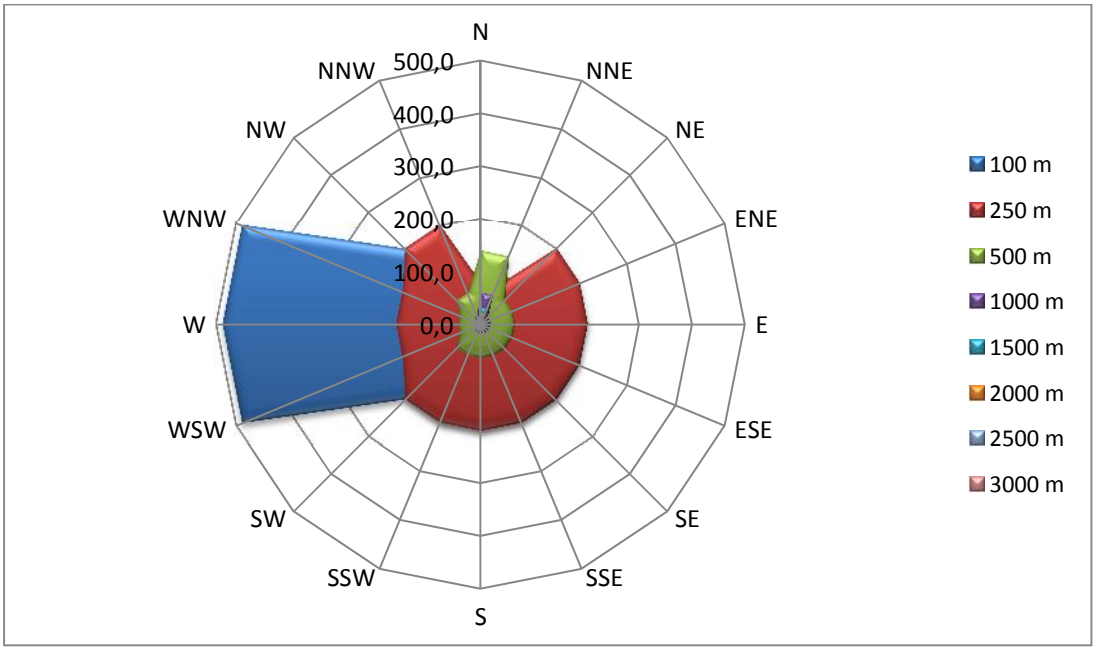


Figure 58 Dispersion of suspended particles based on distance for License No 83221 Stripping Phase (Uncontrolled, µg/m^3)

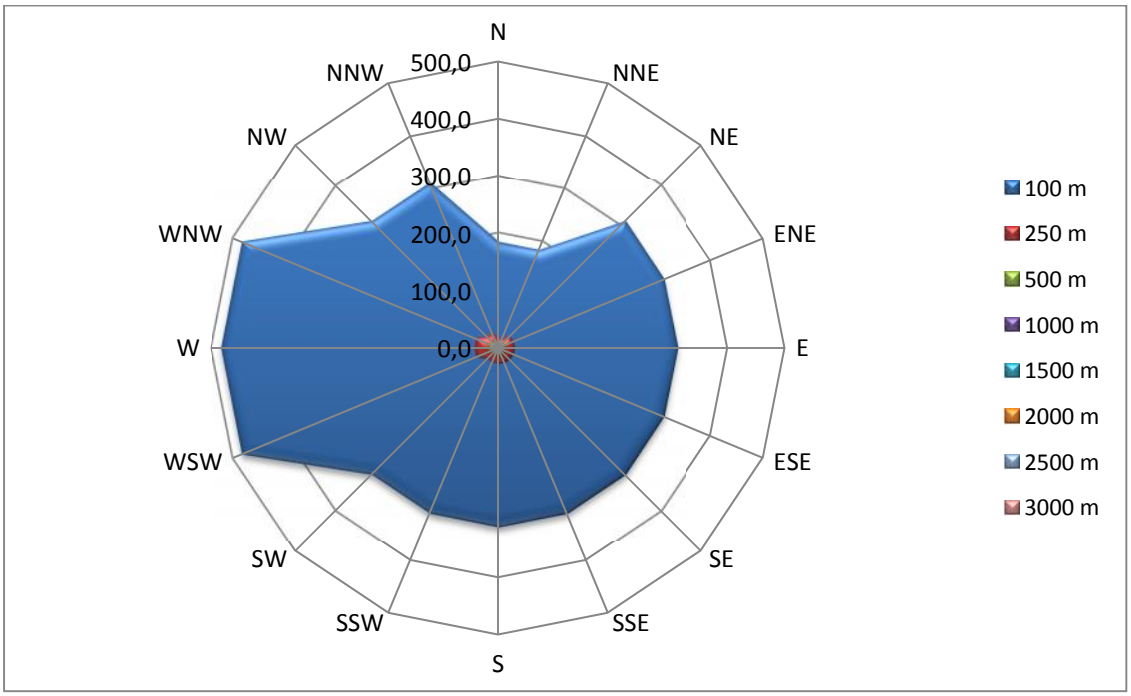


Figure 59 Dispersion of settled dust based on distance for License No 83221 Stripping Phase (Uncontrolled, mg/m^2-h)

The Dust Modelling Results;

Evaluation According to "Air Quality Assessment ans Management Regulation"

Figure 60 The Limit Values of Dust Modelling

Pollutant	**Avarage Period**	**Limit Value**	**Annual Decrease**	**Warning Thersold**
PM10[1]	-Short range limit value- 24 hours % 95/year -to protect human health-	**300 µg/m^3**	Limit value decreases evenly as 12 months from 1.1.2009 to 1.1.2014 until **100 µg/m^3**	The first level: 260 µg/m^3 The second level: 400 µg/m^3 The third level: 520 µg/m^3 The forth level: 650 µg/m^3 (The values are 24-hours avarage.)
	Avarage of Winter Season (1 October – 31 March) -to protect human health-	**200 µg/m^3**	Limit value decreases evenly as 12 months from 1.1.2009 to 1.1.2014 until 9**0 µg/m^3**	
	-Long range limit value- annual -to protect human health-	**150 µg/m^3**	Limit value decreases evenly as 12 months from 1.1.2009 to 1.1.2014 until 60 **µg/m^3**	
	annual -to protect human health-	**10 mg/m^3**		

There are several residentals in the close vicinity of İR 83221 numbered business license site. It has been assumed that the closest residentals are 500 m far away and the calculations have been conducted according to this assumption. The closest residential area nearest to the İR 33838 numberedbusiness license site is Karataş Village, which is about 700 m.

- Short-time value will be under the limit value of after period of 1.1.2014 for the closest residentals.
- The winter season avarage values will be under the limit value of after period of 1.1.2014 for the closest residentals.
- Long-time value the limit value of after period of 1.1.2014 for the closest residentals.
- PM quantity will be under 450 mg/m^2-day for the closest residentals.

The above values were calculated with the assumpion of working all vehicle simultaneously and uncontrolled case. However, the topographical structure of the Project area and mitigation measures will decrease effects of dust. Therefore, the Project work is not expected to have a negative impact on closest residental areas.

b)Gas Emission

Some emission shall be generated by the construction machinery within the scope of the project. Tüpraş-404 shall be used as the fuel for the construction machinery within the site. The general characteristics of Tüpraş-404 diesel fuel are given in the following table.

Table 64 General Characteristics of Tüpraş-404 Diesel Fuel[39]

CHARACTERISTIC	UNIT	VALUE	LIMIT	TEST METHOD
Density (at 15 ^{0}C)	kg/m³	820-845		TS 1013 EN ISO 3675 TS EN ISO 12185
Polycyclic aromatic hydrocarbons	weight %	11		
Flash point	0^C	55	Minimum	TS EN ISO 2719
Cold Filter Plugging Point (CFPP)	0^C			TS EN 116
Winter (a)		-15	Maximum	
Summer (b)		5	Maximum	
Distillation				TS 1232 EN ISO 3405
Achieved at 250 ^{0}C	volume %	65	Maximum	
Achieved at 350 ^{0}C	volume %	85	Minimum	
Temperature at which 95% (volume/volume) achieved	0^C	360	Maximum	
Sulfur	mg/kg	11-1000		TS 6838 EN ISO 8754
Carbon Residue (within 10% distillation residue)	weight %	0.3	Maximum	TS 6148 EN ISO 10370
Viscosity (40 ^{0}C)	cst	2.0-4.5		TS 1451 EN ISO 3104
Copper Strip Corrosion		No.1	Maximum	TS 2741 EN ISO 2160
(3 hours at 50 ^{0}C)				
Ash	weight %	0.01	Maximum	TS 1327 EN ISO 6245
Cetane number		51	Minimum	TS 10317 EN ISO 5165
				TS EN 15195
Cetane Index	calculate	46	Minimum	TS 2883 EN ISO 4264
Water	mg/kg	200	Maximum	TS 6147 EN ISO 12937
Total Pollution	mg/kg	24	Maximum	TS EN 12662
Oxidation Stability	g/m³	25	Maximum	TS EN ISO 12205
Lubricity feature, corrected wear scar diameter (wsd 1.4), at 60 ^{0}C	µm	460	Maximum	TS EN ISO 12156-1
(a) October 1st - March 31st (± 15 days) (b) April 1st - September 30th (±15 days)				

The fuel demand of the construction machinery to be operated within the site shall be 70 L/hr. Thus,

39 www.tupras.com.tr

Q=70 lt/h x 0,835kg/lt = 58.45 kg/h (0,0585 t/h)

Table 65 Emission Factors of the Pollution Emitted from Diesel Vehicles (kg/t) [40]

POLLUTANT	**DIESEL**
Carbon Monoxides	9.7
Hydrocarbons	29
Nitrogen Oxides	36
Sulfur Oxides	6.5
Dust	18

Accordingly, values of polluters expected to be caused by construction machinery:

Table 66 Estimated PollutantValues

Carbon Monoxides	9,7kg/tx0,0585 t/h=0,567 kg/h
Hydrocarbons	29kg/tx0,0585 t/h=1.696 kg/h
Nitrogen Oxides	36kg/tx0,0585 t/h=2.106 kg/h
Sulfur Oxides	6,5kg/tx0,0585 t/h=0,38 kg/h
Dust	18kg/tx0,0585 t/h=1.053 kg/h

Some emission shall be generated by the construction machinery depending on the fuel consumed. Since the mass flow values calculated for constructions machinery are too small, there will be no adverse impacts on the existing air quality. The fuel systems of the vehicles to be operated within the project site shall always be controlled, whereas the provisions of the Regulation on Exhaust Gas Emission Control and Gasoline and Diesel Quality, which has been promulgated in the Official Gazette issue number 28837 on November 30th, 2013, shall be respected.

[40] Hava Kirliliğinin ve Kontrolünün Esasları, 1991

6.2.2. Phosphate Concentrator Facility

a)Dust Emissions

Although a closed system shall be operated within the ore beneficiation facility in general, some equipment such as shuttle conveyor works open-top. In addition, the activities which may generate dust are listed below:

- Storing
- Loading
- Unloading to silo

The amount of excavated ore to be fed to the beneficiation facility per hour is 243.05 tons. The excavated ore shall be transported to the ore beneficiation facility and stored in the material storage are of the facility. Assuming that the ore can be stored for a period of one month with an height of 5 meters in average, the storage area for the excavated ore shall be approximately 13,840 m² (the amount of materials stored in a month is 173,000 tons = 69,200 m³).

Table 67 Controlled and uncontrolled emission values of the concentrator facility

Source of dust	**Uncontrolled emission factor**	**Uncontrolled emission flow rates**	
Storing	5.8	5,8 kg/ha-day x 1,384 ha x day/ 24 hr	0.334 kg/hr
Loading	0.010	243.05 ton/hr x 0.010 kg/ton	2.4305 kg/hr
Unloading	0.010	243.05 ton/hr x 0.010 kg/ton	2.4305 kg/hr
Overall emission flow rate		**5.195 kg/hr**	
Source of dust	**Controlled emission factor**	**Controlled emission flow rates**	
Storing	2.9	2.9 kg/ha-day x 1,384 ha x 1 day / 24 hr	0.167 kg/hr
Loading	0.005	243.05 ton/hr x 0.005 kg/ton	1.2152 kg/hr
Unloading	0.010	243.05 ton/hr x 0.005 kg/ton	1.2152 kg/hr
Overall emission flow rate		**2.5974 kg/hr**	

b)Gas Emissions

While the phosphate concentrator facilities was being operated, phosphate rocks extracted from the mining site was transported to the facility and concentrated here and ore was offered for sales after a drying process. Drying process was conducted by coal. As a result of coal combustion, many components of carbon, sulfur and nitrogen elements are emitted to air as gasses. So, combustion gasses were emitted to atmosphere through the working period.

With the erection and commissioning of the integrated fertilizer facilities, the concentrated phosphate shall be included in the process without being dried and used as raw material in the system. Therefore, no drying process shall be required. Since there shall be no drying process, the furnace and the flue shall be no longer in use. Thus, no coal shall be used as a raw material of a drying process, and hence no gas emissions (combustion gases) or ash shall be generated due to combustion.

6.2.3. Integrated Fertilizer Facility

6.2.3.1.Construction Phase

The gas and dust emissions can be occured from construction machines and dust emission from excavation activities.

a)Dust Emissions

An approximate volume of 850,000 m³ excavation shall be conducted within an area about 170,000 m² for the facilities to be erected within the scope of the project site.

The material extracted by excavations during the construction work within the scope of the project shall be re-used for backfilling.

In case of excavation waste generated within the project area, the provisions of the "*Regulation on Control of Excavation Soil and Construction and Demolition Waste*" promulgated in the Official Gazette issue no. 25406 on 18.03.2004 shall be complied with.

The excavation work within the project area shall be made for leveling the ground. Therefore, no storage shall be necessary, but the topsoil to be removed shall be stored in an appropriate place within the project area to be used for landscaping purposes.

Amount of excavation soil to be generated due to excavations for the facility units:

Every type of ground excavation = 850,000 m³

Density = 1.6 ton/m³

Amount of excavation soil to be generated = 850,000 m³ x 1.6 ton/m³ = 1,360,000 tons

Table 68 Monthly, daily and hourly amount of excavation soil generated due to excavations for facility units

Working time	m^3	ton
63 months	850,000	1,360,000
1 month (26 days)	13,492	21,587
1 day (16 hours)	518.9	830.3
1 hour	32.4	51.9

An approximate amount of 51.9 tons (32.4 m³) shall be excavated per hour within the project site. The average transportation distance among the internal units in the facility is 1.5 km (round-trip).

An approximate amount of 830,3 ton material shall be transported by 50-ton trucks within the site in a day and 17 trips shall be made every working day.

Table 69 Dust emission factors and emission flow rates of facility units excavation

Dust factors	Emission values	Emission flow rates
Removal	0.025 kg/ton	51.9 ton/hr x 0.025 kg/ton= 1.3 **kg/hr**
Transportation	0.7 kg/km-vehicle	(17 trips(vehicle)/day x 0.7 kg/km.vehicle x 1.5 km)/ 16 hour = 1.1 **kg/hour**
Unloading	0.01 kg/ton	51.9 ton/hr x 0.01 kg/ton = **0.519 kg/hr**
Total Emission Amount		**2,919 kg/hour**

The total values of dust emission calculated for the construction phase of the project units are given above. Since the total dust emission arising from construction activities calculated above exceeds the limit value of 1.0 kg/hour stipulated in Appendix-2 of the “Regulation on Control of Industrial Air Pollution” promulgated in the Official Gazette issue no. 27277 on 03.07.2009, a dust modeling has been made.

Dust Modelling for Project Area Excavation Works

The residential area nearest to the project site is Kocakent Village, which is about 2.13 km northeast. The dust modeling has been done based on the nearest residential area.

Q = 2.919 kg/ h

For suspended particles C (x,y,z)

Q = 0.583 kg

h = 20 m.

z = 2 m.

V_{di} = 0,07 m/s

For settled amount of dust (di)

Q = 2.335 kg

h = 20 m.

z = 0

V_{di} = 0,7 m/s

The following dust dispersion tables have been prepared by using the above values and formulae.

Table 70 Dispersion Of Suspended Particles Based On Distance For Project Area Excavation Works

U_a	U_R	U_h	100	500	1000	1500	2000	2250	2500	3000
4.2	4,5	0,00	4,27	7,63	3,25	1,70	1,07	0,74	0,55	0,00
4.3	4,5	0,00	4,27	7,63	3,25	1,70	1,07	0,74	0,55	0,00
3.5	3	11,09	11,17	3,53	0,96	0,45	0,27	0,18	0,13	11,09
2.7	3	11,09	11,17	3,53	0,96	0,45	0,27	0,18	0,13	11,09
2.8	3	11,09	11,17	3,53	0,96	0,45	0,27	0,18	0,13	11,09
2.9	3	11,09	11,17	3,53	0,96	0,45	0,27	0,18	0,13	11,09
3.0	3	11,09	11,17	3,53	0,96	0,45	0,27	0,18	0,13	11,09
2.8	3	11,09	11,17	3,53	0,96	0,45	0,27	0,18	0,13	11,09
2.7	3	11,09	11,17	3,53	0,96	0,45	0,27	0,18	0,13	11,09

2.9	3	11,09	11,17	3,53	0,96	0,45	0,27	0,18	0,13	11,09
2.4	3	11,09	11,17	3,53	0,96	0,45	0,27	0,18	0,13	11,09
2.1	2	27,07	8,93	2,40	0,61	0,28	0,16	0,10	0,07	27,07
1.9	2	27,07	8,93	2,40	0,61	0,28	0,16	0,10	0,07	27,07
2.0	2	27,07	8,93	2,40	0,61	0,28	0,16	0,10	0,07	27,07
2.5	3	11,09	11,17	3,53	0,96	0,45	0,27	0,18	0,13	11,09
3.2	3	11,09	11,17	3,53	0,96	0,45	0,27	0,18	0,13	11,09

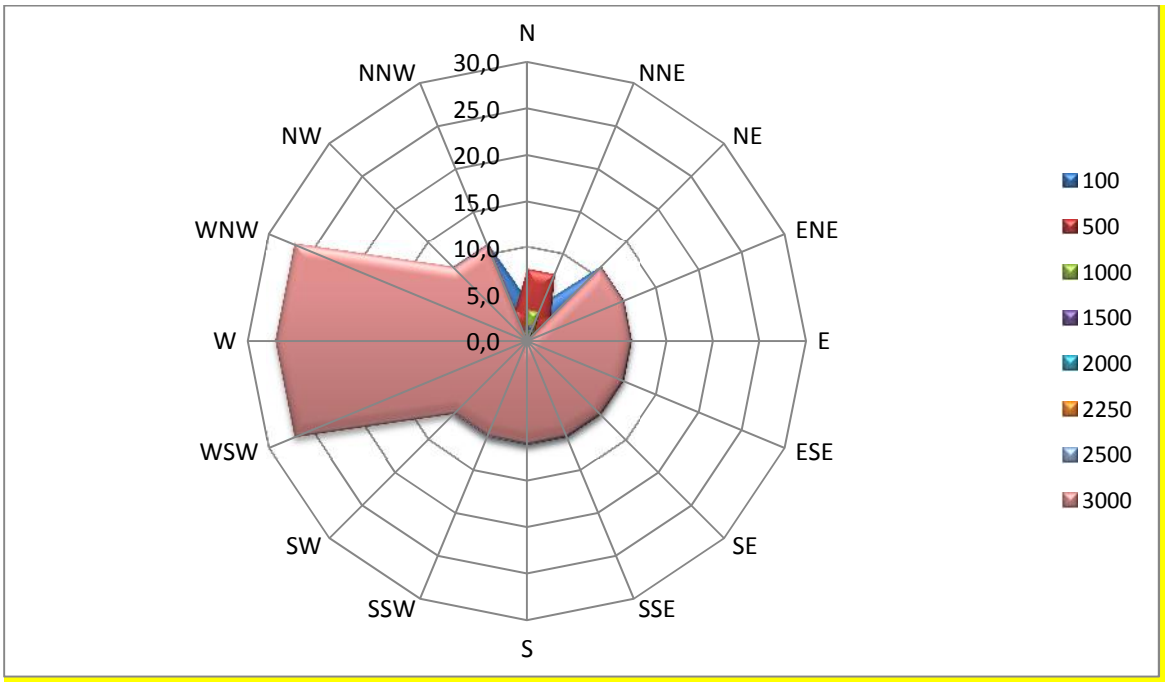


Figure 61 Dispersion Of Suspended Particles Based On Distance For Project Area Excavation Works

Table 71 Dispersion Of Settled Dust Based On Distance For Project Area Excavation Works

U_a	U_R	U_h	100	500	1000	1500	2000	2250	2500	3000
4.2	4,5	0,00	10,22	0,92	0,40	0,22	0,16	0,13	0,11	0,09
4.3	4,5	0,00	10,22	0,92	0,40	0,22	0,16	0,13	0,11	0,09
3.5	3	11,09	17,25	1,54	0,66	0,37	0,27	0,22	0,18	0,16
2.7	3	11,09	17,25	1,54	0,66	0,37	0,27	0,22	0,18	0,16
2.8	3	11,09	17,25	1,54	0,66	0,37	0,27	0,22	0,18	0,16
2.9	3	11,09	17,25	1,54	0,66	0,37	0,27	0,22	0,18	0,16
3.0	3	11,09	17,25	1,54	0,66	0,37	0,27	0,22	0,18	0,16
2.8	3	11,09	17,25	1,54	0,66	0,37	0,27	0,22	0,18	0,16
2.7	3	11,09	17,25	1,54	0,66	0,37	0,27	0,22	0,18	0,16
2.9	3	11,09	17,25	1,54	0,66	0,37	0,27	0,22	0,18	0,16
2.4	3	11,09	17,25	1,54	0,66	0,37	0,27	0,22	0,18	0,16
2.1	2	27,07	26,75	2,36	1,01	0,57	0,42	0,33	0,28	0,24
1.9	2	27,07	26,75	2,36	1,01	0,57	0,42	0,33	0,28	0,24
2.0	2	27,07	26,75	2,36	1,01	0,57	0,42	0,33	0,28	0,24
2.5	3	11,09	17,25	1,54	0,66	0,37	0,27	0,22	0,18	0,16
3.2	3	11,09	17,25	1,54	0,66	0,37	0,27	0,22	0,18	0,16

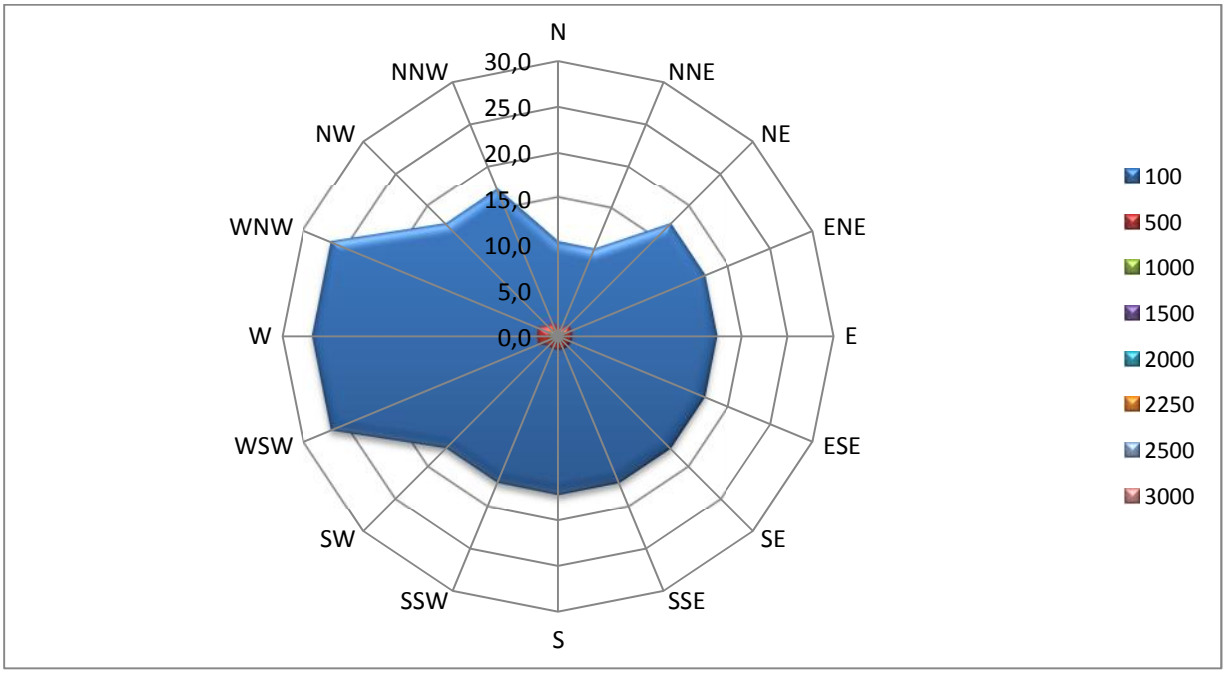


Figure 62 Dispersion Of Settled Dust Based On Distance For Project Area Excavation Works

b)Gas Emission

Some emission shall be generated by the construction machinery within the scope of the project. Tüpraş-404 shall be used as the fuel for the construction machinery within the site.

The fuel demand of the construction machinery to be operated within the site shall be 70 L/hr. Thus,

Q=50 lt/h x 0,835kg/lt = 41.75 kg/h (0,04 t/h)

Table 72 Emission Factors of the Pollution Emitted from Diesel Vehicles (kg/t) [41]

POLLUTANT	**DIESEL**
Carbon Monoxides	9.7
Hydrocarbons	29
Nitrogen Oxides	36
Sulfur Oxides	6.5
Dust	18

Accordingly, values of polluters expected to be caused by construction machinery:

Table 73 Estimated PollutantValues

Carbon Monoxides	9,7kg/tx0,04 t/h=0,39 kg/h
Hydrocarbons	29kg/tx0,04 t/h=1.16 kg/h
Nitrogen Oxides	36kg/tx0,04 t/h=1.44 kg/h
Sulfur Oxides	6,5kg/tx0,04 t/h=0,26 kg/h
Dust	18kg/tx0,04 t/h=0.72 kg/h

Some emission shall be generated by the construction machinery depending on the fuel consumed. Since the mass flow values calculated for constructions machinery are too small, there will be no adverse impacts on the existing air quality. The fuel systems of the vehicles to

[41] Hava Kirliliğinin ve Kontrolünün Esasları, 1991

be operated within the project site shall always be controlled, whereas the provisions of the Regulation on Exhaust Gas Emission Control and Gasoline and Diesel Quality, which has been promulgated in the Official Gazette issue number 28837 on November 30th, 2013, shall be respected.

6.2.3.2. Operation Phase

1.Sulphuric Acid Facility

2.Ammonia Facility

3.Phosphric Acid Facility

4.Fertilier Production Facility

5.Fertilizer Packaging Facility

Sulphuric Acid Facility Emissions

The stack specifications of sulphuric acid plant are given in below table.

Table 74 The stack specifications of sulphuric acid plant

Stack height	60 m
Stack diameter	3 m
Stack gas exit speed	10,2 m/s
Stack gas flow rate	312.000 kg/h
Stack gas density	1,2 kg/m^3
Stack gas temperature	80 ^{0}C

The emission values of plant are given in following table.

Table 75 The Emissions of sulphuric acid plant

Emissions	
SO_2	2 kg/ton sulfuric acid
SO_3	-

H_2SO_4	-

Ammonia Plant Emissions

The stack specifications of ammonia plant are given in below table.

Table 76 The stack specifications of ammonia plant

Stack height	66 m
Stack diameter	2 m
Stack gas exit speed	4 m/s
Stack gas flow rate	40200 Nm^3/h
Stack gas density	0,78 g / l
Stack gas temperature	160 ^0C

The emission values of plant are given in following table.

Table 77 The emissions of ammonia plant

Emissions	
NH_3	50 mg/Nm^3
SO_x	200 mg/Nm^3
NO_x	200 mg/Nm^3
PM	50 mg/Nm^3
H_2S	0,5 mg/Nm^3
CO_2	9824 Nm^3/h

Phosphoric Acid Emissions

The stack specifications of phosphoric acid plant are given in below table.

Table 78 The stack specifications of phosphoric acid plant

Stack height	40 m
Stack diameter	2,85 m
Stack gas exit speed	11,2 m/s
Stack gas flow rate	320.000 kg/h
Stack gas density	1,25 kg/m^3
Stack gas temperature	80 ^{0}C

The emission values of plant are given in following table.

Table 79 The emissions of phosphoric acid plant

Emissions	
F	5 mg/Nm^3
P2O5	50 mg/Nm^3
PM	<50 mg/Nm^3

Fertilizer Production Plant Emission

The stack specifications of fertilizer production plant are given in below table.

Table 80 The stack specifications of fertilizer production plant

Stack height	35 m
Stack diameter	2,5 m

Stack gas exit speed	11,3 m/s
Stack gas flow rate	250.000 kg/h
Stack gas density	1,25 kg/m^3
Stack gas temperature	70 ^{0}C

The emission values of plant are given in following table.

Table 81 The emissions of fertilizer production

Emissions	
F	5 mg/Nm^3
P2O5	-
PM	50 mg/Nm^3

Fertilizer Packaging Plant Emissions

The stack specifications of fertilizer packaging plant are given in below table.

Table 82 The stack specifications of fertilizer packaging plant

Stack height	35 m
Stack diameter	1,2 m
Stack gas exit speed	8,5 m/s
Stack gas flow rate	49.200 kg/h
Stack gas density	1,23 kg/m^3
Stack gas temperature	30 ^{0}C

The emission values of plant are given in following table.

Table 83 The emissions of fertilizer packaging plant

Emissions	
PM	50 mg/Nm^3

Required filtration systes will be installed in the facilities. Stack gas cleaning/scrubbing systems, cyclones, dust and ash traps will be installed.

Evaluation According to National Regulations

Regulation on Control of Air Pollution Originating From Industry

Annex1 Air Emission Principles and Limit Values for Operators

Possible sudt materials are phosphorus and phosphates. Phosphorus is inclued in 1.class while phosphates are 3.classs.

The phosphorus emission values can not be exceed 20 mg/Nm^3 and phosphates can not be exceed 75 mg/Nm^3.

Annex-4 Determination of stack height and speed in facilities subject to licensing

Speed of stack gas originating from production method;

"Waste gases originating from the process should be discharged into the atmosphere by free air current through a vertical exit and without facing any obstruction. For this purpose, a stack should be used and the speed of gases leaving the stack should be at least 4 m/s in the facilities where forced draught is applicable. In the event that the stack diameter cannot be narrowed and forced draught cannot be applied due to the production process and production method of the facility and where this situation can be approved by a report of a scientific organization, the speed of stack gas should be at least 2 m/s."

The all stack gas speeds are greater than 2 m/s. Therefore the provision of related regulation is provided.

Annex-5 Special Emission Limits for Facilities Having Highly Polluting Nature

D) GROUP FOUR FACILITIES

2) Facilities where nonferrous metals are produced or recovered:

The following principles should be complied with at the facilities where nonferrous metals are recovered (including the facilities where copper is produced from copper ore) :

2.1) The waste gases with volumetric SO_2 content of 2% or over should be utilized. The utilization of SO_2 and SO_3 emissions will be performed in accordance with Attachment-5.H.3.

2.2) The waste gases with volumetric SO_2 content of less than 2% , the sulphur dioxide emission should be limited with 3 g/Nm^3.

2.3) In order to get protected against the emission in dust form discharged from the stacks of facilities should not exceed the limit value of 30 mg/Nm^3. In order to achieve these limit values waste gases containing dust should be released to the atmosphere after going through a dust catcher. Furthermore, The principles set forth in Attachment-1 should be complied with.

2.4) The standards issued by the Turkish Institute of Standards, if any, will have effect on the technological applications, otherwise the best available techniques should be complied with.

2.5) The principles set forth in Attachment-1 should be complied with.

H) GROUP EIGHT FACILITIES: Acid Production Facilities:

3) <u>Sulphur Dioxide, Sulphur Trioxide and Sulphuric Acid Production Facilities</u> :

In these facilities the following principles shall be complied with:

In case sulphuric acid is also produced in the facilities where copper metal is produced from copper ore the following provisions and limit values shall be complied with.

3.1) In the facilities where sulphur dioxide is produced by absorption or liquefaction method at 100% the final gas is sent to alkaline wash facility or to the sulphuric acid facility
In the alkaline wash method the emission of SO_2 in the stack gas should not exceed 30 mg/Nm^3 , it should not exceed the value given in paragraph (2) in the sulphuric acid production.

3.2) In the sulphur trioxide and sulphuric acid producing facilities where the rate of volumetric SO_2 in the usage gas is 8% or over, the conversion rate should be kept at least at 99.5%, when breakdown occurs in the facility the conversion rate should be kept at least at 99% and at the facilities where the volumetric SO_2 in the usage gas is between 6% and 8% the conversion rate should be kept at least at 99%. Here the SO_3 emission per ton of sulphuric acid should not exceed 0.4 kg.

3.3) In the sulphur trioxide and sulphuric acid producing facilities where the volumetric rate of SO_2 in the usage gas is less than 6% , or at the wet catalyst facilities where the production capacity is below 100 ton/hour the rate of conversion should be kept at 97.5%. Here, SO_3 emission per ton of H_2SO_4 produced may not exceed 0.6 kg.

3.4) Emissions in the form of aerosol should be reduced by means of aerosol separators.

3.5) The SO_3 emission per ton of sulphuric acid should not exceed 5 kg in these facilities.

3.6) The sulphur trioxide SO_3 emission may not exceed 60 mg/Nm^3 in fixed gas conditions and 120 mg/Nm^3 in other conditions.

Emissions occur in acid production facilities are given in following table.

Table 84 Emission Values for Acid Production

	Sulphuric Acid Production Facility	**Phosphoric Acid Facility**
SO_2	2 kg/ton sulphuric acid	-
SO_3	-	-
H_2SO_4	-	-
F	-	5 mg/Nm^3
P2O5	-	-
PM	-	<50 mg/Nm^3

In sulphuric acid facility, there will be both dry and wet gas cleaning systems. S02 gas would be taken through the cyclones after the waste heat boiler so that it would be ensured that a portion of ash and dust inside it would further be retained. S02 gas comes to the electro-static filter from the cyclones. Here, ash and dust particles remaining inside the gas are settled by means of high voltage so that they are purged from S02 gas.

S02 gas which is cleared of a significant portion of solid substances contained in it in the dry gas cleaning part must be cleared in a wet condition depending on its physic-chemical composition.

In the phosphoric acid facility, the stack gas will be scrubbed. Then, it will be sent to the atmosphere after cleaning.

R) GROUP SEVENTEEN FACILITIES: Fertilizer Production Facilities:

In these facilities the following principles shall be complied with:

1) In nitrogen oxide emissions, Group 8 facilities shall comply with the principles laid down in subsection (2).

2) In sulphur dioxide, sulphur trioxide emissions, Group 8 facilities shall comply with the principles laid down in subsection (3).

3) Ammonia containing gases will be washed. The washing water will be either returned to the process or discharged into the sewer. When discharged into the sewer, the ammonia concentration in the receiving gas environment should not exceed 30 mg/Nm^3 . The emission of NH_3 in waste gases should not exceed 50 mg/Nm^3.

4) The concentration of gaseous fluorine compounds given as F- in waste gases should not exceed 10 mg/Nm^3. Attachment-1 subsection (h) shall not apply in this regard.

5) The dust emissions in waste gases should not exceed 100 mg/Nm^3.

6) The provisions and limit values of the relevant groups in Attachment-5 shall apply to the combustion and gasification units of fertilizer complexes.

7) The relevant principles set forth in Attachment-1 are valid excluding the issues mentioned above.

The emission values in the fertilizer plant are given in next table.

Table 85 Emission Values for Fertilizer Production

	Fertilizer Production Facility	**Fertilizer Packaging Facility**
F	5 mg/Nm^3	-
P_2O_5	-	-
PM	50 mg/Nm^3	50 mg/Nm^3

The stack gas occured from fertilizer facility will be filtrated. The dust collacted in filters will be sent to the system again as return material. The gas will be cleaned first. Than it will be sent to the atmosphere.

S) GROUP EIGHTTEEN FACILITIES Ammonia Production Facilities:

In these facilities the following principles shall be complied with:

1) The ammonia emissions formed in these facilities are Class IV emissions mentioned in Attachment-7, Table 7.2.1 (Inorganic Vapour and Gas Emissions).

2) The emissions of organic compounds in Class IV should not exceed 200 mg/Nm^3 (for emission flow rates of 5 kg/hour or over).

The foregoing limit values will have effect after 1/1/2012.

3) The relevant principles set forth in Attachment-1 are valid excluding the issues mentioned above.

The emission values in the ammonia plant are given in next table.

Table 86 Emission Values for Ammonia Production

	Ammonia Production Facility
NH_3	50 mg/Nm^3
SO_x	200 mg/Nm^3
NO_x	200 mg/Nm^3
PM	50 mg/Nm^3
H_2S	0,5 mg/Nm^3

The stack gas values will be under the limit values by way of filters, Hg extractor, H_2S and CO_2 collecter.

Evaluation According to International Guidelines

The limit values are given in Environmental, Health and Safety Guidelines of International Finance Corporation. These guidelines are;

- EHS Guidelines for Mining
- EHS Guidelines for Large Volume Inorganic Compounds Manufacturing and Coal Tar Distillation
- EHS Guidelines for Phosphate Fertilizer Manufacturing
- EHS Guidelines for Base Metal Smelting and Refining

Tablo 1 Çevre, Sağlık ve Güvenlik Kılavuzlarında Verilen Emisyon Limit Değerleri

Pollutant	Unit	Limit Value	Project Value
Ammonia Production Facility			
NO_x	mg/Nm3	300	200
NH_3	mg/Nm3	50	50
PM	mg/Nm3	50	50
Sulphuric Acid Production Facility			
SO_2	mg/Nm3	450 (2 kg/t acid)	2 kg/ ton asit
SO_3	mg/Nm3	60 (0.075 kg/t acid)	-
H_2S	mg/Nm3	5	-
NO_x	mg/Nm3	200	-
Phosphoric Acid Facility			
Floride (HF)	mg/Nm3	5	5
PM	mg/Nm3	50	<50
Fertilizer Production Facility			
Floride	mg/Nm3	5	5
PM	mg/Nm3	50	50
HCl	mg/Nm3	30	-
NOx	mg/Nm3	70	-
Leaching Facility			
Acid mists/gas	mg/Nm3	50	
VOC	mg/Nm3	5-15	

Arsin	mg/Nm3	0.5	

The Results of Air Quality Dispersion Modelling

This modeling report has been prepared for the purpose of calculating emissions and their air pollution contributive values, which would arise from Integrated Fertilizer Plant owned by **Eti Bakır AŞ (Eti Copper Industries Corp.) Mazıdağı Works**, in respect of which an International Environmental and Social Effects Assessment Report has been prepared and molar flow rates have been calculated, by means of the internationally accepted AERMOD distribution model and analyzing their distributions in the plant impact area.

The model outputs are of such structure which would allow preparation of distribution maps for entire study area. Thus, it is possible to assess local Air Quality under various scenarios (for example various conditions of increases, different sources of pollutants or different seasonal conditions).

The modeling study which ensures estimation of concentrations of the pollutants in gas and dust form in the ambient air by means of mathematical calculations comprises the following steps:

- "Distribution Zone" is determined for the sources.
- This distribution zone is divided into a grid system which is composed of squares (having a resolution of 200 m x 200 m in this study); information on latitudes, longitudes and height is obtained in connection therewith. The corner points of the squares ar their top points.
- Information is determined on the sources of pollutants.

Upon running the program after transfer of the above listed operations into the program, hourly, daily and annual ground level concentration values of the pollutants in the media may be forecast.

Emission measurements have been taken in the survey areas for the purpose of calculating the air pollution contributive values of the emission which would generate from the plant. By having assessed the measurement results in conjunction with the model results, overall pollution value (TKD) has been calculated indicating the cumulative effect. These results are provided by following table.

Table 87 Air Quality Measurement Results

Points	**Concentration (µg/m^3)**

	SO_2	NO_2	HCl^-	HF^-	NH_3	H_2S
Point 1	<1,50	1,91	2,75	3,32	5,69	<0,066
Point 2	<1,50	2,05	2,81	3,56	3,48	<0,066
Point 3	<1,50	2,11	3,49	2,78	14,01	<0,066
Point 4	<1,50	2,02	<2,70	2,78	6,12	<0,066
Point 5	<1,50	2,36	4,28	4,01	46,91	0,144
Point 6	<1,50	1,29	3,46	3,11	5,32	<0,066
Point 7	<1,50	1,66	3,68	3,09	3,11	0,161
Point 8	1,98	3,68	3,57	3,21	7,53	<0,066

The modeling works have been carried out for the parameters of SO_2, NO_2, PM_{10}, H_2S and HF^- and potential effects to be created by the pollutant source on the local Air Quality have been investigated. The estimated emission values obtained from the modeling works and limit values relevant thereto are provided by next table.

Table 88 Estimated YSK Values Obtained As a Result of the Modeling Study

Parameter	**Period**	**Level Ground Concentrations ($\mu g/m^3$)**	**Limit Values* ($\mu g/m^3$)**
SO2	*Hourly (max)*	772,88	-
	Hourly (%99,72)	342,98	350
	Daily (max)	100,84	-
	Daily (%99,17)	56,80	125
	Annually	7,41	20
NO2	*Hourly (max)*	40,52	-
	Hourly (%99,72))	23,42	200
	Annually	0,48	40
PM_{10}	*Daily (max)*	29,52	-
	Daily (%90,41)	6,13	50
	Annually	3,19	40

H_2S	*Hourly*	1,70	30
	KVS	0,24	5
HF^-	*Hourly*	17,62	100
	KVS	2,79	20

The hourly, daily and annual values to be created by S02 emissions which would generate from the plant are 772,88 µg/m^3, 100,84 µg/m^3 and 7,41 µg/m^3, respectively and the daily and annual values remain the limit values, which are required to be observed from 2019 (125 µg/m^3 and 20 µg/m^3, respectively).

the hourly and annual YSK values to be created by N02 emissions which would generate from the plant are 40,52 µg/m^3 ve 0,48 µg/m^3, respectively and they remain below the limit values required to be observed from 2024 (200 µg/m^3 and 40 µg/m^3, respectively).

The daily and annual YSK values to be created by PM10 emissions which would generate from the plant are 29,52 µg/m^3 ve 3,19 µg/m^3, respectively and they remain below the limit values required to be observed from 2019 (50 µg/m^3 ve 40 µg/m^3, respectively).

Because the plant emissions concentrate in the higher zones, PM10 remains below the limit values.

The daily and short term (daily) YSK values to be created by H2S emissions which would generate from the plant are 1,70 µg/m^3 Daily 0,24 µg/m^3, respectively and they remain below the limit values required to be observed from 2013 (30 µg/m^3, 5 µg/m^3, respectively).

As is the case for S02 parameter emission distributions, the concentrations are higher in such zones which are higher topographically and further that the concentrations are lower on such lower elevations. N02 emissions do not exceed the Regulation limit values in the Residential Areas because there are no Residential Areas on the hills and the Residential Areas in the daily impact area are on such elevations similar to those of the plant

In conclusion, considering entire recipient medium integrally, it is expected that the effect of the proposed plant on the local Air Quality would not be of any significant dimensions.

6.3.Noise

6.3.1.Phosphate Mine Sites

a)Stone Skidding

One of the environmental factors caused by blasting is stone fragments flying to very long distances. The formula is used for this.

$L = 260 \times d^{2/3}$

L = Maximum stone skidding distance (m)

d = Hole diameter (m)

$\Phi = 0.1 \times d^{2/3}$

Φ = Size of stone fragments (m)

$L = 260 \times (0{,}076)^{2/3} = 46.65$ m

$\Phi = 0.1 \times (0.076)^{2/3} = 0.018$ m = 1.8 cm

It is predicted that 1.8-cm stones will be skidded to 47-m distance as a result of blasting. There are houses of Karataş Village about 700 meters to the mining site. There are several residentals in the close vicinity of mine site. It has been assumed that the closest residentals are 500 m far away. Skidded stones caused by blasting will not impact Karataş Village adversely.

Air Shock

Reaction-product gasses released to atmosphere rapidly from rock cracks create significant noise. If necessary precautions are not taken, the level noise reaches to higher dimensions and transforms into air-shock waves. Impact distance of air shocks can be calculated by the following formulae.

Severe Impact Zone: $D < 5\sqrt{W}$

Moderate Impact Zone: $5\sqrt{W} < D < 10\sqrt{W}$

Mild Impact Zone: $10\sqrt{W} < D < 15\sqrt{W}$

D = Impact zone interval (m)

W = Amount of explosives used during on delay interval (kg)

A total amount of 8.5 kg explosives shall be placed in a hole during one delay interval in the open pit.

Severe Impact Zone: $D < 5\sqrt{8.5} \Rightarrow D < 14.58$

Moderate Impact Zone: $5\sqrt{8.5} < D < 10\sqrt{W} \Rightarrow 14.58 < D < 29.15$

Mild Impact Zone: $10\sqrt{8.5} < D < 15\sqrt{8.5} \Rightarrow 29.15 < D < 43.73$

It is predicted that the impact of the air shock will be effective up to a distance of 43.73 meters as a result of blasting. There are houses of Karataş Village about 700 meters to the mining site. There are several residentals in the close vicinity of mine site. It has been assumed that the closest residentals are 500 m far away. Air shock caused by blasting will not impact Karataş Village adversely.

b)Vibration

Shock waves caused by a blast propagate within the rock unit fired with a specific velocity, frequency, and amplitude, similar to shock waves in air. This propagation continues until the energy of the shock (seismic) waves are over and tends to fade with distance from the shot.

One of the common problems faced with when operating a mine is vibration and air shocks caused by the use of explosives. Another one is noise generated by construction machinery and trucks to be used. The real source of vibrations occurring as a result of operations within the site is the ground seism caused by blasting. Therefore, the distance to be affected by vibration depending on the amount of explosives to be used for blasting is determined. The impacts of the vibrations occurring as a result of controlled blasting system are kept to a minimum.

There are two types of velocity when a blast takes place; the first one is the velocity of wave or phase depending on the density of the interrupted environment and the second one is particle velocity affecting the wave velocity and hence forming an oscillation movement due to disruption of the balance position. There are two vibration calculations below by using the following formulae based on wave velocity and the vibration amplitude of the blast, respectively.

a) Vibration calculation based on wave velocity

Devine At Al Formula (1966);

- $V = k (D / \sqrt{W})^{-1.6}$

V = velocity of vibration propagating within rock (inch/sec.)

k = coefficient depending on the type of rock (26 – 260)

D = Effective distance between the blast and the surrounding accommodation units (feet)

W = amount of explosives within one delay interval (pound)

(1 feet = 0.3048 m, 1 pound = 0.45369 kg, 1 inch = 24.5 mm)

The coefficient (k) of the Devine formula is considered as the vibration transmission capacity of the rock. The variability of the units between the source of blast and the sensitive point as well as the intensity of discontinuities such as fractures, faults, and cracks have an influence on the coefficient (k). The coefficient approaches to 260 for homogeneous units, while approaching to 26 by the intensity of tectonic effects and various units passed through. Since fractured structures are encountered in mining sites even if just a bit, the coefficient (k) has been considered as 200 in average.

Table 89 Vibration Velocity Values

k	V (inch/sec.)	V (mm/sec.)	1/5*V (mm/sec.)	1/2*V (mm/sec.)	V (inch/sec.)
200	50	2,119401	51,92532	10,38506	25,96266
200	100	0,699142	17,12897	3,425794	8,564484
200	140	0,408094	9,998305	1,999661	4,999152
200	200	0,230631	5,650452	1,13009	2,825226
200	250	0,161384	3,953914	0,790783	1,976957
200	300	0,120551	2,953502	0,5907	1,476751
200	350	0,094201	2,307928	0,461586	1,153964
200	400	0,07608	1,863954	0,372791	0,931977
200	450	0,063012	1,543801	0,30876	0,7719
200	**500**	**0,053237**	**1,304305**	**0,260861**	**0,652153**
200	600	0,039767	0,974292	0,194858	0,487146
200	**700**	**0,031075**	**0,761332**	**0,152266**	**0,380666**
200	750	0,027827	0,681763	0,136353	0,340881
200	800	0,025097	0,614876	0,122975	0,307438
200	900	0,020786	0,509264	0,101853	0,254632
200	1000	0,017562	0,43026	0,086052	0,21513
200	1250	0,012289	0,301075	0,060215	0,150538
200	1500	0,00918	0,224898	0,04498	0,112449

In the table above:

V represents the vibration velocity changing according to distance. Internal rock vibration velocity has been accepted as 1/2 - 1/5 of (V); while building foundation vibration velocity has accepted as (V_o). (Frossbland, 1981)

Table 90 Types of buildings that can be damaged due to blasting depending on building foundation vibration velocity (V_o)

Building Type	**(V_o) (mm/sec.)**
a – Very old and dilapidated historical buildings	2
b – Houses made of plastered bricks, adobe bricks, masonry bricks	5
c – Reinforced concrete buildings	10
d – Very strong industrial buildings like factories	10 - 40

(b)-type buildings within the housing units in the vicinity are considered as the most sensitive ones. Vibration higher than 5 mm/sec. within foundations of such buildings is not desirable.

Analyzing the above table, the building foundation vibration created by the impact of 8.5 kg charge drops below 5 mm/sec. after 140 meters.

The vibration impact distance for blasts made by 8.5-kg explosive per hole has been found to be 140 meters. Therefore, vibrations to be created will not impact closest residentals adversely.

b) Based on vibration amplitude

The amplitude of the vibration generated by blasting is calculated based on the formula below.

Armac Printing Company Formula

$$A = (K \sqrt{W}) / D$$

A = Maximum amplitude of vibrations generated by blasting (mm)

K = Coefficient depending on rock type

W = Amount of explosives fired within one delay interval (kg)

D = Effective distance between the blast and the surrounding accommodation units (m)

Table 91 Maximum and minimum values of coefficient K changing depending on the type of rock blasted and type of rock under the building foundation (Armac Printing Company)

Unit Blasted	Type of rock under foundation	Coefficient K	
		Minimum	Maximum
1 - Rock	Rock	0.57	1.15
2 - Rock	Clay (soil)	1.15	2.3
3 – Clay (soil)	Rock	1.15	2.3
4 – Clay (soil)	Clay (soil)	2.3	3.4

Since it is known that buildings would not be damaged when the amplitude value is below 0.05 mm (Armac Printing Company), the impact distance of shots performed by using maximum amount of explosives (8.5 kg) is as follows:

$$D = (K / \sqrt{W}) / A = (0.57\sqrt{8.5}) / 0.05 = 33.23m$$

The impact distance of blasts made by 8.5 kg explosive per hole has been found as 33.23 m. Therefore, vibrations to be created will not impact closest residentals adversely.

d)Noise

It is planned to work 16 hours a day in the site. The potential sources of noise during the operations are given in the following table.

Table 92 Types and quantities of construction machinery to be used for ore production and stripping within the scope of the project

Construction machinery for ore production and transportation	**Quantity**	**Construction machinery for stripping and transportation**	**Quantity**
Trucks	7	Trucks	20
Rock machine	1	Rock machine	2
Dozer	1	Dozer	2
Excavator	4	Excavator	7
Roller	1		
Grader	1		
Sprinkler	2		

Allowed sound power levels and noise marking specified in the "Regulation on environmental noise emission generated by equipment used outdoor" issued by the Ministry of Industry and Trade and promulgated in the Official Gazette issue number 26392 on 30.12.2006 and the formulae given in the 5th article of the regulation, the heading of which is "Standards", have been used for calculating the overall sound power levels of the construction machinery and equipment to be used within the scope of the project within the four-octave band between 500 and 4000 Hz.

Table 93 Types of equipment and sound power levels defined according to net power level thereof

Type of equipment	Net installed power P (kW), Electric power Pel (1) (kW), Implementation mass m (kg), Cutting width L (cm)	Allowed sound power level dB/1 pW	
		As from July 3rd, 2004 Phase I	**As from January 3rd, 2006 Phase II**
Compression machines (vibratory rollers, vibrating plates, vibratory hammers)	P ≤ 8	108	105
	8 < P ≤ 70	109	106
	P > 70	89 + 11 log P	86 + 11 log P
Crawler dozers, crawler loaders, crawler backhoe loaders	P ≤ 55	106	103
	P > 55	87 + 11 log P	84 + 11 log P
Wheel dozers, wheel loaders, wheeled backhoe loaders, dump trucks, graders, loader-type land fill compressors, internal combustion engine driven counterbalanced hydraulic lift trucks, mobile cranes, compaction machines (vibration-free rollers) pavement finishing machines, hydraulic power generation machines	P ≤ 55	104	101
	P > 55	85 + 11 log P	82 + 11 log P

***Excavator*:**

If P = 150 Hp = 112 kW * P > 55 kW, then the allowed sound power level is

(Lw) = 84 + 11 log P 112 kW > 55 kW, therefore;

Lw = 84 + 11 log 112 = 107 dB

Grader:

If P = 150 Hp = 112 kW * P > 55 kW, then the allowed sound power level is

(Lw)= 82 + 11 log P 112 kW > 55 kW, therefore;

Lw = 82 + 11 log 112 = 105 dB

Dozer:

If P = 150 Hp = 112 kW * P > 55 kW, then the allowed sound power level is

(Lw)= 82 + 11 log P 112 kW > 55 kW, therefore;

Lw = 82 + 11 log 112 = 105 dB

Truck:

If P = 120 Hp = 90 kW * P > 55 kW, then the allowed sound power level is

(Lw)= 82 + 11 log P 90 kW > 55 kW, therefore;

Lw = 82 + 11 log 90 = 104 dB

Sprinkler:

If P = 120 Hp = 90 kW * P > 55 kW, then the allowed sound power level is

(Lw)= 82 + 11 log P 90 kW > 55 kW, therefore;

Lw = 82 + 11 log 90 = 104 dB

Roller:

If P = 120 Hp = 90 kW * P > 55 kW, then the allowed sound power level is

(Lw)= 86 + 11 log P 90 kW > 55 kW, therefore;

Lw = 82 + 11 log 90 = 104 dB

Rock Machine:

If P = 150 Hp = 112 kW * P > 55 kW, then the allowed sound power level is

(Lw) = 84 + 11 log P 112 kW > 55 kW, therefore;

Lw = 84 + 11 log 112 = 107 dB

: (1 Hp = 0,746 kW)

Since the number of construction machines to be sued for stripping within the phosphate mine is high, calculations has been made by using these equipment quantities under the assumption that all equipment work simultaneously. However, this assumption does not reflect the real situation. This assumption has been chosen to be on the safe side by using worst-case scenario. The sound power levels are given in the table below.

Table 94 Sources of Noise and Sound Power Levels

Sources of Noise	**Quantity**	**Total**
Rock machines	2	107
Trucks	20	104
Excavators	7	107
Sprinklers	2	104
Grader	1	105
Roller	1	104
Dozer	2	105

Calculations of noise to be generated by equipments are given below.

The distribution of sound power level of each source of noise to 4-octave band between 500 and 4000 Hz has been illustrated in the following table by calculating the sound power level in each octave band.

$L_{w(i)} = 10^{*} \log (10^{(Lw/10)} / 4)$

L_w= Sound power level of the source (dB)

Table 95 Distribution of sound power levels of noise sources to be used within the project site to octave bands

Sources of noise	**Total**	**Sound power level (dB)**			
		500 Hz	**1000 Hz**	**2000 Hz**	**4000 Hz**
Excavator	107	101	101	101	101
Dozer	105	99	99	99	99
Rock machine	107	101	101	101	101
Truck	104	98	98	98	98
Roller	104	98	98	98	98
Sprinkler	104	98	98	98	98
Grader	105	99	99	99	99

Distribution of total sound power levels to 4-octave band is assumed to be equal.

$Lp = Lw + 10 * \log Q / 4 * \prod * r^2)$

Lpi = Noise pressure levels of sources in the free zone at the distance r (dB)

Lw= Sound power level of the source (dB)

Q = Orientation coefficient (assumed to be 1)

r = Distance to the source (meters)

Table 96 Sound pressure levels of noise sources to be used within the project site

Source of noise	**Distance (m)**	**Sound pressure level (dB)**			
		500 Hz	**1000 Hz**	**2000 Hz**	**4000 Hz**
Excavator	100	59.02	59.02	59.02	59.02
	500	45.04	45.04	45.04	45.04
	1000	39.02	39.02	39.02	39.02

	1500	35.50	35.50	35.50	35.50
	2000	33.00	33.00	33.00	33.00
	2500	31.06	31.06	31.06	31.06
	3000	29.48	29.48	29.48	29.48
Dozer	100	57.02	57.02	57.02	57.02
	500	43.04	43.04	43.04	43.04
	1000	37.02	37.02	37.02	37.02
	1500	33.50	33.50	33.50	33.50
	2000	31.00	31.00	31.00	31.00
	2500	29.06	29.06	29.06	29.06
	3000	27.48	27.48	27.48	27.48
Rock machine	100	59.02	59.02	59.02	59.02
	500	45.04	45.04	45.04	45.04
	1000	39.02	39.02	39.02	39.02
	1500	35.50	35.50	35.50	35.50
	2000	33.00	33.00	33.00	33.00
	2500	31.06	31.06	31.06	31.06
	3000	29.48	29.48	29.48	29.48
Truck	100	56.02	56.02	56.02	56.02
	500	42.04	42.04	42.04	42.04
	1000	36.02	36.02	36.02	36.02
	1500	32.50	32.50	32.50	32.50

	2000	30.00	30.00	30.00	30.00
	2500	28.06	28.06	28.06	28.06
	3000	26.48	26.48	26.48	26.48
Roller	100	56.02	56.02	56.02	56.02
	500	42.04	42.04	42.04	42.04
	1000	36.02	36.02	36.02	36.02
	1500	32.50	32.50	32.50	32.50
	2000	30.00	30.00	30.00	30.00
	2500	28.06	28.06	28.06	28.06
	3000	26.48	26.48	26.48	26.48
Sprinkler	100	56.02	56.02	56.02	56.02
	500	42.04	42.04	42.04	42.04
	1000	36.02	36.02	36.02	36.02
	1500	32.50	32.50	32.50	32.50
	2000	30.00	30.00	30.00	30.00
	2500	28.06	28.06	28.06	28.06
	3000	29.48	29.48	29.48	29.48
Grader	100	57.02	57.02	57.02	57.02
	500	43.04	43.04	43.04	43.04
	1000	37.02	37.02	37.02	37.02
	1500	33.50	33.50	33.50	33.50
	2000	31.00	31.00	31.00	31.00

	2500	29.06	29.06	29.06	29.06
	3000	27.48	27.48	27.48	27.48

The outcomes of the calculations for pressure levels absorbed by the atmosphere at certain distances are given below in dB:

A_{atm} (Atmospheric Absorption) = 7.4 *10-8 (f2 *r / ϕ) dB

f = Frequency of the noise source (or the center frequency of the frequency band) (Hz) (assumed to be 2500)

r = Distance from the source (m)

ϕ = Relative humidity of air (%) (assumed to be 75%)

Table 97 Atmospheric absorption values calculated based on distance

Frequency (Hz)	**Distance (m)**	**Atmospheric Absorption**
500	100	0.025
	500	0.123
	1000	0.247
	1500	0.370
	2000	0.493
	2500	0.617
	3000	0.740
1000	100	0.099
	500	0.493
	1000	0.987

	1500	1.480
	2000	1.973
	2500	2.467
	3000	2.960
2000	100	0.395
	500	1.973
	1000	3.947
	1500	5.920
	2000	7.893
	2500	9.867
	3000	11.840
4000	100	1.579
	500	7.893
	1000	15.787
	1500	23.680
	2000	31.573
	2500	39.467
	3000	47.360

The net sound level of each noise source after deducting atmospheric absorption values has been calculated in accordance with the following formula and given in the table below.

Within first 100 meters $L_P \cong L_{Port}$

After 100 meters $L_P = L_{Port} - A_{At\ m}$

Table 98 Distance-dependent sound pressure levels of each source of noise to be used within the operation site

Source of noise	**Distance (m)**	**Sound pressure level (dB)**			
		500 Hz	**1000 Hz**	**2000 Hz**	**4000 Hz**
Excavator	100.00	59.00	58.92	58.63	57.44
	500.00	44.92	44.55	43.07	37.15
	1000.00	38.77	38.03	35.07	23.23
	1500.00	35.13	34.02	29.58	11.82
	2000.00	32.51	31.03	25.11	1.43
	2500.00	30.44	28.59	21.19	-8.41
	3000.00	28.74	26.52	17.64	-17.88
Dozer	100.00	57.00	56.92	56.63	55.44
	500.00	42.92	42.55	41.07	35.15
	1000.00	36.77	36.03	33.07	21.23
	1500.00	33.13	32.02	27.58	9.82
	2000.00	30.51	29.03	23.11	-0.57
	2500.00	28.44	26.59	19.19	-10.41
	3000.00	26.74	24.52	15.64	-19.88
Rock machine	100.00	59.00	58.92	58.63	57.44
	500.00	44.92	44.55	43.07	37.15
	1000.00	38.77	38.03	35.07	23.23

	1500.00	35.13	34.02	29.58	11.82
	2000.00	32.51	31.03	25.11	1.43
	2500.00	30.44	28.59	21.19	-8.41
	3000.00	28.74	26.52	17.64	-17.88
Truck	100.00	56.00	55.92	55.63	54.44
	500.00	41.92	41.55	40.07	34.15
	1000.00	35.77	35.03	32.07	20.23
	1500.00	32.13	31.02	26.58	8.82
	2000.00	29.51	28.03	22.11	-1.57
	2500.00	27.44	25.59	18.19	-11.41
	3000.00	25.74	23.52	14.64	-20.88
Roller	100.00	56.00	55.92	55.63	54.44
	500.00	41.92	41.55	40.07	34.15
	1000.00	35.77	35.03	32.07	20.23
	1500.00	32.13	31.02	26.58	8.82
	2000.00	29.51	28.03	22.11	-1.57
	2500.00	27.44	25.59	18.19	-11.41
	3000.00	25.74	23.52	14.64	-20.88
Sprinkler	100.00	56.00	55.92	55.63	54.44
	500.00	41.92	41.55	40.07	34.15
	1000.00	35.77	35.03	32.07	20.23
	1500.00	32.13	31.02	26.58	8.82

	2000.00	29.51	28.03	22.11	-1.57
	2500.00	27.44	25.59	18.19	-11.41
	3000.00	28.74	26.52	17.64	-17.88
Grader	100.00	57.00	56.92	56.63	55.44
	500.00	42.92	42.55	41.07	35.15
	1000.00	36.77	36.03	33.07	21.23
	1500.00	33.13	32.02	27.58	9.82
	2000.00	30.51	29.03	23.11	-0.57
	2500.00	28.44	26.59	19.19	-10.41
	3000.00	26.74	24.52	15.64	-19.88

It is assumed in the table that the sound pressure levels of the sources of noise are distributed to the four-octave band equally. The correction factors given in the table has been used for calculating the sound pressure levels of the sources of noise within the operation site.

Table 99 Correction factors based on frequencies

Center frequency (Hz)	Correction factor
500	-3.2
1000	0
2000	1.2
4000	1

As a result of the calculation based on correction factors given above, the sound pressure level of each source of noise in the 4-octave band is given in the table below.

Table 100 Net sound levels of each source of noise to be used in the operation site based on distance

Source of noise	**Distance (m)**	**Sound pressure level dB**			
		500 Hz	**1000 Hz**	**2000 Hz**	**4000 Hz**
Excavator	100	55.80	58.92	59.83	58.44
	500	41.72	44.55	44.27	38.15
	1000	35.57	38.03	36.27	24.23
	1500	31.93	34.02	30.78	12.82
	2000	29.31	31.03	26.31	2.43
	2500	27.24	28.59	22.39	-7.41
	3000	25.54	26.52	18.84	-16.88
Dozer	100	53.80	56.92	57.83	56.44
	500	39.72	42.55	42.27	36.15
	1000	33.57	36.03	34.27	22.23
	1500	29.93	32.02	28.78	10.82
	2000	27.31	29.03	24.31	0.43
	2500	25.24	26.59	20.39	-9.41
	3000	23.54	24.52	16.84	-18.88
Rock machine	100	55.80	58.92	59.83	58.44
	500	41.72	44.55	44.27	38.15
	1000	35.57	38.03	36.27	24.23
	1500	31.93	34.02	30.78	12.82
	2000	29.31	31.03	26.31	2.43
	2500	27.24	28.59	22.39	-7.41

	3000	25.54	26.52	18.84	-16.88
Truck	100	52.80	55.92	56.83	55.44
	500	38.72	41.55	41.27	35.15
	1000	32.57	35.03	33.27	21.23
	1500	28.93	31.02	27.78	9.82
	2000	26.31	28.03	23.31	-0.57
	2500	24.24	25.59	19.39	-10.41
	3000	22.54	23.52	15.84	-19.88
Roller	100	52.80	55.92	56.83	55.44
	500	38.72	41.55	41.27	35.15
	1000	32.57	35.03	33.27	21.23
	1500	28.93	31.02	27.78	9.82
	2000	26.31	28.03	23.31	-0.57
	2500	24.24	25.59	19.39	-10.41
	3000	22.54	23.52	15.84	-19.88
Sprinkler	100	52.80	55.92	56.83	55.44
	500	38.72	41.55	41.27	35.15
	1000	32.57	35.03	33.27	21.23
	1500	28.93	31.02	27.78	9.82
	2000	26.31	28.03	23.31	-0.57
	2500	24.24	25.59	19.39	-10.41
	3000	25.54	26.52	18.84	-16.88

Grader	100	53.80	56.92	57.83	56.44
	500	39.72	42.55	42.27	36.15
	1000	33.57	36.03	34.27	22.23
	1500	29.93	32.02	28.78	10.82
	2000	27.31	29.03	24.31	0.43
	2500	25.24	26.59	20.39	-9.41
	3000	23.54	24.52	16.84	-18.88

L_T = Total sound level (dBA)

$L_T = 10\log\sum 10^{Li/10}$

The equivalent levels of noise to be generated in case of simultaneous operation of all machines, which is the worst case here, have been calculated and given in the table.

$L_{gündüz} = L_{eşdeğer}$

$L_{eşdeğer} = 10\ \log\sum 10^{LT/10}$

Table 101 Net sound levels of all sources of noise to be used within the operation site based on distance

Distance (m)	**Lday (dBA)**
100	100.04
500	64.34
1000	57.54
1500	53.50
2000	50.59
2500	48.30
3000	46.61

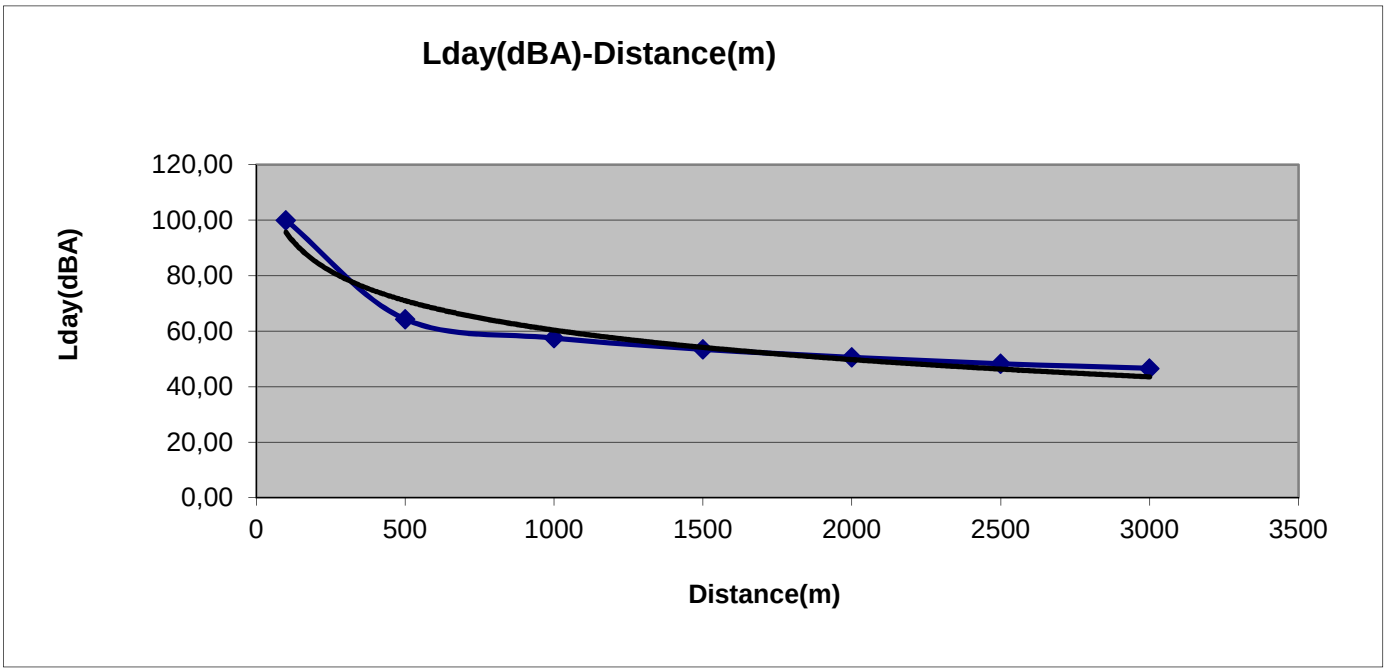


Figure 63 Chart of noise distribution based on distance

The level of noise at 100 meters due to Phosphate Mining operations has been calculated as 100.04 dBA. This is the outcome of the calculation based on the assumption that all equipment work simultaneously. Therefore, the real values will be much lower.

6.3.2. Phosphate Concentrator Facility

The existing residential areas closest to the concentrator plant are Kocakent Village, approximately 2.13 km northeast, Karataş Village, approximately 2.7 km west, Ekinciler Village, approximately 2.9 km southeast, and Sürendal Village, approximately 7 km northwest. It has been determined during the inspections conducted by the Provincial Directorate of Environment and Urbanization on 19.09.2012 that, the plant is at a minimum distance of 500 meters from very sensitive and sensitive utilizations. Since the plant is out of the residential areas, for which noise maps must be prepared within the context of the Regulation on Assessment and Management of Environmental Noise, it is exempted from noise assessment and an acoustic report must be issued. The letter regarding noise exemption is in **Annex-18**.

The equipments to be operated in the plant for beneficiation process are apron feeder, jaw crusher, screen, belt conveyor, shuttle conveyor, rotary washer, pulp tank and cyclone

The background measurements have been made in the acoustic report prepared during planning phase of Integrated Fertilizer Facility. These measurements demonstrate the circumstances where the existing concentrator works. While conducting measurements on background noise level of the facility, which is already installed, the areas to be impacted has been taken into account. Thus, background measurements have been conducted at 5 points in total around the facility and the nearest house.

During the background noise level measurements, the equivalent total noise at 1/3 octave band and octave band noises have been determined. The background noise level measurements have been conducted in accordance with the standards TS 9315 ISO 1996-1:2005 and TS ISO 1996-2:2009.

Svantek Svan 948 1/3 Octave Band Type 1 measurement device has been used for the measurements within the operating area. A-weighted equivalent continuous sound pressure levels with 8 minutes in average have been taken in the measurements. The distances of the measurement points are given in the following table.

Table 102 Distances of the measurement points

Measurement Points	**Distance to project area**
1. Measurement Point	within the project area
2. Measurement Point	within the project area
3. Measurement Point	within the project area
4. Measurement Point	within the project area
5. Measurement Point, the nearest house	2000 m

The outcomes of the background noise measurements are given in the following table.

Table 103 Background noise measurements

Day Background	**Unit**	**Measurement start time**	**Measurement end time**	**Leg(A)**
1	dB	12:35	12:43	42.0

2	dB	12:53	13:00	42.9
3	dB	13:05	13:13	39.9
4	dB	13:20	13:28	40.1
5	dB	13:43	14:00	46.1

6.3.3. Integrated Fertilizer Facility

6.3.3.1.Construction Phase

The machines and equipments that will be used during construction phase are given next table.

Table 104 Machines And Equipments That Will Be Used During Construction Phase

Machines and equipment	**Unit**
Loader	2
Crane	3
Dozer	3
Truck	4
Forklift	4
Tractor	3
Excavator	3

The sound power level of the machines are given following table.

Table 105 The sound power level of the machines

Machines and equipments	**Sound Power Level**		
	Low	**Medium**	**High**
Loader	105	115	120
Crane	110	115	120
Dozer	115	120	130
Truck	115	120	130
Forklift	105	115	120
Tractor	110	120	130
Excavator	105	115	120

Equivalent sound power levels are given below.

Table 106 Equivalent Sound Power Levels Versus Distance

Dispersion Distance (m)	**250**	**500**	**1000**	**2000**
Low	54,48	46,52	40,50	34,48
Medium	60,96	53,00	46,98	40,96
High	70,06	62,10	56,08	50,06

5.3.3.2. Operation Phase

Environmental noise calculation based on operation phase have been conducted. The sound power levels in operation phase are given in below.

Table 107 Sound Power Level in Operation Phase

Dispersion Distance (m)	**250**	**500**	**1000**	**2000**
Low	55,19	49,17	43,15	37,13
Medium	61,51	55,48	49,46	43,44
High	67,08	61,15	55,03	49,01

The facility falls in Table 4: “Areas Where Work Places are Densely Located As far As the Areas In Which the Commercial Structures and uses vulnerable to noise co-exist are concerned” in Annex VII to the Regulation on Assessment and Management of Environmental Noise (ÇGDYY) which entered into force upon promulgation in Official Gazette Issue No 27601 of 04.06.2010.

Table 108 Environmental noise limit levels for the Industrial plants given in Table-4, ANNEX-VII of Turkish Assessment of Environmental Noise Regulation.

Areas	$L_{daytime}$ (dBA)	$L_{evening}$ (dBA)	L_{night} (dBA)
Of the noise-sensitive areas; training, culture and health areas as well as areas where the summer resorts and camp sites are dense	60	55	50
Of the areas where commercial structures and the usages sensitive to the noise exist together, the areas where the residents are dense	**65**	**60**	**55**
Of the areas where commercial structures and the usages sensitive to the noise exist together, the areas where the business offices are dense	68	63	58
Industrial areas	70	65	60

6.4.Water Usage and Waste Water Occurance

6.4.1.Phosphate Mine Site

Waste water which would generate at the stage of construction of the project are such domestic waste water which would generate due to water consumption by the staff, who would work at the stage of construction, for drinking and service purposes.

Drinking water requirements will be met by buying and using commercially available drinking water in plastic bottles and large glass containers holding authorization and licenses. utility and irrigation water is supplied from 10 water wells already drilled or being drilled within the plant campus.

In order to prevent dust generation within the project site; water shall be sprayed on internal roads in the quarry, stabilized road and asphalt road connections depending on the season and the evaporation rate. An irrigation vehicle with a daily capacity of 10 m^3 shall be used for irrigating roads.

The total number of personnel to be worked for the project in accordance with the work schedule is 80. Depending on the potable and utility water consumed by the personnel within the site, domestic-type waste water shall be generated. The total water requirement has been calculated based on the assumption that the amount of daily water requirement per capita is 150 liters.[42]

[42]Su Temini ve Atıksu Uzaklaştırılması Uygulamaları İTÜ – 1998, Prof. Dr.Dinçer TOPACIK, Prof. Dr. Veysel EROĞLU

Table 109 Water Utilization in Phosphate Mining Sites

Number of workers to be employed	80 persons
Amount of water to be used	150 L/person-day = 0.15 m^3/person-day
Total water requirement	0.15 m^3/person-day x 80 persons = 12 m^3/day
Water utilization	
Road irrigation	10 m^3/day
Total	**22 m^3/day**

Domestic-type waste water shall only be generated as a result of the water consumption of the personnel employed for the project. Based on the assumption that the entire water used by the personnel during the construction phase will be returned as waste water, the daily amount of domestic-type waste water to be generated will be 12 m³.

Table 110 Domestic-type waste water contaminants in phosphate mining sites and average concentrations thereof

PARAMETER	CONCENTRATION
pH	6-9
AKM	200 mg/L
BOİ5	200 mg/L
KOİ	500 mg/L
Total Nitrogen	40 mg/L
Total Phosphorus	10 mg/L

According to the above table, the contaminant loads within the domestic-type waste water generated by 80 persons to be employed within the scope of the project are as follows:

Table 111 Contaminant loads within the domestic-type waste water

AKM	4.4 kg/day	(22 m^3/day x 200 mg/L /1000)
BOİ5	4.4 kg/day	(22 m^3/day x 200 mg/L /1000)
KOİ	11 kg/day	(22 m^3/day x 500 mg/L /1000)
Total Nitrogen	0.88 kg/day	(22 m^3/day x 40 mg/L /1000)
Total Phosphorus	0.22 kg/day	(22 m^3/day x 10 mg/L /1000)

The provisions of the Regulation on Water Pollution Control promulgated in the Official Gazette issue no. 25687 on 31.12.2004 shall be respected within the scope of the project.

Waste water to be generated are collected in the sealed cesspool and discharged and disposed by Mazıdağı Municipality for a fee.

6.4.2. Phosphate Concentrator Facility

In the Phosphate Concentrator Facilities, there shall be utility-potable water consumption of the employees on a daily basis, water consumption for spraying operations within the scope of the activities which may cause dust generation within the facility area, and process water consumption for washing the material sized in the facility.

The amount of water to be used for abovementioned purposes and the supply methods are described below.

- Water required for the use of personnel

225 employees shall work in the phosphate concentrator facilities. Daily utility and potable water requirements of the employees shall be supplied from the municipal water system of Mazıdağı Municipality. In case of potable water cannot be met in this way, it will be supplied from the market in permitted and licensed carboys. As for the cases the utility water cannot be supplied from the municipal water system, about 10 water wells with 500 m depth drilled or to be drilled within the plant campus shall be used.

Daily utility and potable water requirements of the personnel to be employed are calculated below.

Table 112 Domestic Waste Water

No of persons to be employed	= 225 person
Volume of water to be used	= 150 L/person-day = 0.15 m^3/person-day
Total water requirements	= 0.15 m^3/person-day x 225 person = 33.75 m^3/day

Based on the assumption that water used would entirely return as waste water eventually, the total volume of Domestic Waste Water generated by the staff would be 33.75 m^3/day under the project.

- Water required for dust control

An approximate daily water consumption of 10 m^3 is predicted for moistening the areas within the plant. Domestic-type waste water generated by the employees shall be treated and then reused for dust control in the areas within the plant.

- Process water requirement

122 tons fresh water shall be fed per hour for washing the material sized in the plant. This fresh water shall be supplied from 10 wells with 500-m depth drilled or to be drilled within the campus of the plant. The Well Use Permits for the wells already drilled are given in **Annex-9**. Water recovered from condensers shall also be used for the washing process in addition to fresh water.

6.4.3. Integrated Fertilizer Facility

6.4.3.1.Construction Phase

Water is required during the operations within the site for the social needs (potable and utility water the personnel) and irrigation purposes. Within the scope of the project, potable water is supplied by means of permitted and licensed carboys, while utility and irrigation water is supplied from 10 water wells already drilled or being drilled within the plant campus.

Wastewater

Due to utility or potable water consumed by the personnel, some waste water will be generated within the site. The total water requirement has been calculated based on the assumption that the required amount of water per capita is 150 L/day[43]

Table 113 Water Consumption During The Construction Phase Of Integrated Fertilizer Facility

Construction phase	
Number of workers to be employees	=500 persons
Amount of water to be consumes	= 150 L/person-day = 0.15 m^3/person-day
Total water requirement	= 0.15 m^3/person-day x 526 persons = 75 m^3/day

Domestic-type waste water shall only be generated as a result of the water consumption of the personnel employed for the construction phase of the project. Based on the assumption that the entire water used by the personnel during the construction phase will be returned as waste water, the total amount of domestic-type waste water to be generated will be 75 m^3/day.

Table 114 Typical domestic-type water contaminants and average concentrations thereof

[43] Su Temini ve Atıksu Uzaklaştırılması Uygulamaları İTÜ – 1998, Prof. Dr.Dinçer TOPACIK, Prof. Dr. Veysel EROĞLU

PARAMETER	CONCENTRATION
pH	6-9
AKM	200 mg/L
BOİ5	200 mg/L
KOİ	500 mg/L
Total Nitrogen	40 mg/L
Total Phosphorus	10 mg/L

According to the table above, the contaminant loads in the domestic-type waste water to be generated due to 500 personnel during the construction of the project have been calculated as follows:

Table 115 Contaminant loads in domestic-type waste water

AKM	15 kg/day	(75 m^3/day x 200 mg/L /1000)
BOİ5	15 kg/day	(75 m^3/day x 200 mg/L /1000)
KOİ	37.5 kg/day	(75 m^3/day x 500 mg/L /1000)
Total Nitrogen	3 kg/day	(75 m^3/day x 40 mg/L /1000)
Total Phosphorus	0.75 kg/day	(75 m^3/day x 10 mg/L /1000)

The domestic-type waste water to be generated due to employees shall be analyzed in accordance with the provisions of the Regulation on Control of Water Pollution promulgated in the Official Gazette issue no. 25687 on 31.12.2004 and the Wastewater Treatment Plant Technical Procedures Communiqué. If the criteria stipulated in the relevant legislations are fulfilled as a result of analysis, waste water shall be used for irrigation purposes within the site.

6.4.3.2. Operation Phase

In operation phase, water is required during the operations within the site for the social needs (potable and utility water the personnel) and process requirements.

Water Usage for Staff and Wastewater

Total water requirements have been calculated on the basis of the assumption of the water volume of 150 l/day[44] required per person.

Table 116 Water Usage and Wastewater in Operation Phase

Operation Phase	
No of persons to be employed	=526 people
Volume of water to be used	= 150 lt/person-day = 0,15 m^3/person-day
Total water requirements	= 0,15 m^3/person-day x 526 person = 78.9 m^3/day

Based on the assumption that water used would entirely return as waste water eventually, the total volume of Domestic Waste Water generated by the staff would be 78.9 m^3/day under the project.

Table 117 Domestic-type waste water contaminants in phosphate mining sites and average concentrations thereof

PARAMETER	**CONCENTRATION**
pH	6-9
AKM	200 mg/L
BOİ5	200 mg/L
KOİ	500 mg/L
Total Nitrogen	40 mg/L
Total Phosphorus	10 mg/L

According to the above table, the contaminant loads within the domestic-type waste water generated by 526 persons to be employed within the scope of the project are as follows:

[44] Su Temini ve Atıksu Uzaklaştırılması Uygulamaları (Water Supply and Waste Water Disposal Practices) İTÜ - 1998, Prof. Dr.Ülkeyr TOPALOĞLU, Prof. Dr. Veysel EROĞLU

AKM	15.78 kg/day	(78.9 m^3/day x 200 mg/lt /1000)
BOİ5	15.78 kg/day	(78.9 m^3/day x 200 mg/lt /1000)
KOİ	39.45 kg/day	(78.9 m^3/day x 500 mg/lt /1000)
Total Nitrogen	3.156 kg/day	(78.9 m^3/day x 40 mg/lt /1000)
Total Phosphorus	0,789 kg/day	(78.9 m^3/day x 10 mg/lt /1000)

Process Water Usage and Waste Water

Procces water balance diagram is given in following figure.

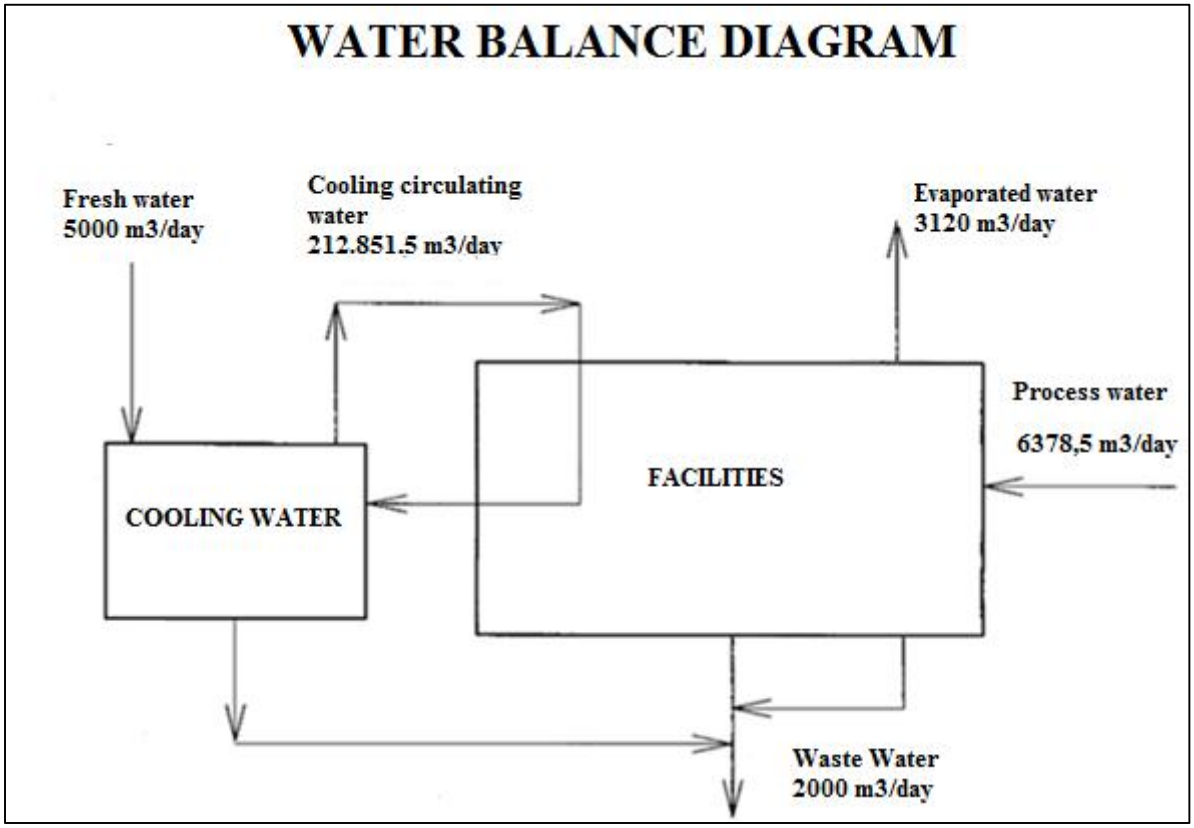


Figure 64 Water Balance Dıagram

Cooling water will be reused after cooling in towers. However, it is considered that some cooling works will be made with air. For this reason, cooling water will be under the calculated value. 5.000 m3/day make-up water will be required for possible cooling water lost.

Therefore, the total water requirement is 11.378,5 m^3/day.

The amount of process wastewater is 2000 m^3 /day.

The process waste water will be reused in the system after treatment. Wastewater discharge will not be conducted.

The limit values of waste water on national and international standards are given in following table.

Table 118 Wastewater Criterias of Phosphate Fertilizer Manufacturing

Pollutant	**Unit**	**Water Pollution Control Regulation**	**EHS Guidelines for Phosphate Fertilizer Manufacturing (IFC)**
pH		6-9	6-9
Total Phosphorus	mg/L	5	-
Floride	mg/L	20	15
TSS	mg/L	50	100
Cd	mg/L	0.1	0.5
Total nitrogen	mg/L	15	-
Ammonium nitrogen	mg/L	-	50
Nitrate nitrogen	mg/L	-	50
Ammonia	mg/L	10	-
Total metal	mg/L	10	-
Phosphate phosphorus	mg/L	-	35

Table 119 Wastewater Criterias of Ammonia Production

Pollutant	**Unit**	**Water Pollution Control Regulation**	**EHS Guidelines for Large Volume Inorganic Compounds Manufacturing and Coal Tar Distillation (IFC)**
pH		6-9	6-9
Ammonia	mg/L	10	-
TSS	mg/L	30	-

Table 120 Wastewater Criterias of Sulphuric Acid Production

Pollutant	**Unit**	**Water Pollution Control Regulation**	**EHS Guidelines for Large Volume Inorganic Compounds Manufacturing and Coal Tar Distillation (IFC)**
pH		6-9	6-9
Phosphorus	mg/L	5	
TSS	mg/L	30	
Floride	mg/L	20	

Table 121 Wastewater Criterias of Phosphoric Acid Acid Production

Pollutant	**Unit**	**Water Pollution Control Regulation**	**EHS Guidelines for Large Volume Inorganic Compounds Manufacturing and Coal Tar Distillation (IFC)**
pH		6-9	6-9
Phosphorus	mg/L	5	35
TSS	mg/L	30	100
Floride	mg/L	20	15

Table 122 Wastewater Criterias of Leach Facility

Pollutant	**Unit**	**Water Pollution Control Regulation**	**EHS Guidelines for Base Metal Smelting and Refining (IFC)**
pH		6-9	6-9
COD	mg/L	50	60
Floride	mg/L	5	-
TSS	mg/L	20	50
Cd	mg/L	0.05	0.2
Hydrocarbons	mg/L	5	-
Aluminium	mg/L	0.2	50
Copper	mg/L	0.1	3
Lead	mg/L	0.1	-
Arsenic	mg/L	0.05	-

Nickel	mg/L	0.1	35
Zinc	mg/L	0.2	-
Mercury	mg/L	0.01	0.05
Free sulphur	mg/L	-	10
Total Chromium	mg/L	-	1

The limit values are given according to both national and International Standards. The smallest value will be complied as limit value as worst case scenario.

6.5.Waste

6.5.1.Phosphate Mine Sites

a)Solid Waste

About 80 personnel work production and stripping operations within the phosphate sites.

The amount of domestic solid waste to be generated by the personnel is given in the table below based on 1.14 kg of daily domestic solid waste generation per capita[45].

Table 123Domestic solid waste generation in phosphate mining sites

Number of workers	80 workers
Amount of solid waste	1.14 kg/day
Amount of solid waste per capita	**1.14 kg/day x 80 person=91.2 kg/day-person**

The amount of solid waste to be generated within the scope of the project has been calculated 91.2 kg/day-person in total, which is in compliance with the "Regulation of Solid Waste Control" promulgated in the Official Gazette issue number 20814 on 14.03.1991. Pursuant to the 8th article of the "*Regulation of Solid Waste Control*", these wastes are collected and deposited separately in order to facilitate disposal and recovery thereof without damage to the environment on the purpose of preventing environmental pollution and contributing to the

[45]TÜİK, Belediye Katı Atık İstatistikleri, 2012

economy. Wastes are transported to an area designated by Mazıdağı Municipality by means of straight trucks without polluting the environment.

b)Excavation Waste

Excavated material extracted during production shall be removed by stripping operations. And the material obtained by stripping are stored in the tipples located in the concentrator facility area.

c)Hazardous Waste

Unusable tires which may come out of construction machines are disposed by delivering licensed recover facilities in accordance with the provisions of the "*Regulation on Control of End-of-Life Tires*" promulgated in the Official Gazette no. 26357 on 25.11.2006.

Hazardous wastes generated within the scope of the project (oils, fuels, empty oil cans, and oakum, gloves, clothes, etc. contaminated with chemicals such as paint) are deposited in sealed containers marked with "*Hazardous Waste*" separately from other wastes in compliance with the "*Regulation on Hazardous Waste Control*" promulgated in the Official Gazette no. 25755 on 14.03.2005. Hazardous wastes are deposited temporarily and dispatched to recovery/disposal facilities by means of licensed transporter companies.

A contract with a licensed company has been made for vegetable waste oils generated within the scope of the project and these oils are delivered to this company for disposal in compliance with the provisions of the Regulation no. 25791 on Control of Waste Oils dated 19.04.2005.

The provisions of the "*Regulation on General Principles of Waste Management*" promulgated in the Official Gazette no. 26927 on 05.07.2008 are complied with throughout the construction phase within the scope of the project.

6.5.2. Phosphate Concentrator Facility

The total number of employees is 225 while the phosphate concentrator plant is in operation. The plant is not in use currently. Nevertheless, the calculations have been made based on 225 employees, considering the impacts caused by the plant during operation.

Dometic Type Solid Waste

About 225 personnel work production and stripping operations within the phosphate sites.

The amount of domestic solid waste to be generated by the personnel is given in the table below based on 1.14 kg of daily domestic solid waste generation per capita[46].

Table 124Domestic solid waste generation in phosphate mining sites

Number of workers	225 workers
Amount of solid waste	1.14 kg/day
Amount of solid waste per capita	**1.14 kg/day x 225 person=256.5 kg/day-person**

The amount of solid waste to be generated within the scope of the project has been calculated 256.5 kg/day-person in total, which is in compliance with the "Regulation of Solid Waste Control" promulgated in the Official Gazette issue number 20814 on 14.03.1991. Pursuant to the 8th article of the "*Regulation of Solid Waste Control*", these wastes are collected and deposited separately in order to facilitate disposal and recovery thereof without damage to the environment on the purpose of preventing environmental pollution and contributing to the economy. Wastes are transported to an area designated by Mazıdağı Municipality by means of straight trucks without polluting the environment.

Domestic-type solid wastes to be generated during the operational phase of the intended plant shall be transported to an area designated by Mazıdağı Municipality. The relevant letter of Mazıdağı Municipality is attached hereto (Refer to **Annex-19**).

Packaging Wastes

Paper bags, cardboard boxes, glass bottles, beverage packaging boxes, metal beverage cans, etc. are the packaging wastes included in the domestic-type solid wastes.

Waste Oil

Waste lubricating oils are included in the category 13.02.08 of other engine, gear and lubricating oils of Appendix IV of the Regulation on General Principles of Waste Management, promulgated in the Official Gazette issue no. 26927 on 05.07.2008.

There shall be some vegetable waste oil generated by the existing dining hall within the scope of the project.

Hazardous waste

[46]TÜİK, Belediye Katı Atık İstatistikleri, 2012

Hazardous wastes generated within the scope of the project are oils, fuels, empty oil cans, and oakum, gloves, clothes, etc. contaminated with chemicals such as paint, all kinds of materials, paint cans, fluorescent lamps, electrical cables, etc.

In the Phosphate concentrator facility, there is not any chemical process. The process is beneficiation of large all-in-ore. For this aim, crushing, screening, cleaning and drying Works are conducted. Hazardous waste other than listed above are not expected to occur.

End-of-life tires

End-of-life tires generated within the scope of the project are the unusable tires which may come out of construction machines.

Medical waste

Medical waste to be generated within the project area shall be caused by the infirmary, which is already installed for the workers to be employed.

Waste batteries and accumulators

There shall be some waste batteries and accumulators generated due to machined to be operated during the facility construction phase.

6.5.3. Integrated Fertilizer Facility

6.5.3.1.Construction Phase

Domestic Type Solid Waste

500 personnel shall be employed in 2 shifts for the construction phase of the intended facility. There shall be some domestic-type solid waste generated by the personnel. The amount of domestic-type solid waste generated by the personnel is calculated as follows by using 1.14 kg domestic-type solid waste amount per capita:[47]

[47] www.tüik.gov.tr - Municipal solid waste statistics, 2012

Table 125 Amounts of domestic-type solid wastes to be generated by the personnel employed for the construction phase of the project

Number of personnel employed for the construction phase of the project	= 500 persons
Solid waste amount to be used	= 1,14 kg/day
Solid waste amount to be generated	**= 1,14 kg/day x 500 persons = 570 kg/day-person**

Packaging Wastes

Paper bags, cardboard boxes, glass bottles, beverage packaging boxes, metal beverage cans, etc. are the packaging wastes included in the domestic-type solid wastes.

Waste Oil

Waste lubricating oils are included in the category 13.02.08 of other engine, gear and lubricating oils of Appendix IV of the Regulation on General Principles of Waste Management, promulgated in the Official Gazette issue no. 26927 on 05.07.2008.

There shall be some vegetable waste oil generated by the existing dining hall within the scope of the project.

Hazardous waste

Hazardous wastes generated within the scope of the project are oils, fuels, empty oil cans, and oakum, gloves, clothes, etc. contaminated with chemicals such as paint, all kinds of materials, paint cans, fluorescent lamps, electrical cables, etc.

End-of-life tires

End-of-life tires generated within the scope of the project are the unusable tires which may come out of construction machines.

Medical waste

Medical waste to be generated within the project area shall be caused by the infirmary, which is already installed for the workers to be employed.

Waste batteries and accumulators

There shall be some waste batteries and accumulators generated due to machined to be operated during the facility construction phase.

Excavation waste

Excavation waste to be generated during the construction phase is composed of wooden mold residuals, iron residuals, unusable construction materials, etc.

6.5.3.2. Operation Phase

Domestic Type Solid Waste

526 personnel shall be employed in 3 shifts for the operation phase of the intended facility. There shall be some domestic-type solid waste generated by the personnel. The amount of domestic-type solid waste generated by the personnel is calculated as follows by using 1.14 kg domestic-type solid waste amount per capita.

Table 126 Amounts of domestic-type solid wastes to be generated by the personnel employed for the operation phase of the Integrated Fertilizer Facility

No of workers to be employed	= 526 people
Volume of solid waste to be used	= 1.14kg/day
Volume of Solid Waste Which Would Generate	**= 1.14kg/day x 526 people=600 kg/day-person**

Domestic-type solid wastes to be generated during the operational phase of the intended plant shall be transported to an area designated by Mazıdağı Municipality. The relevant letter of Mazıdağı Municipality is attached hereto (Refer to **Appendix-??**).

The domestic waste according to their types are given below.

Packaging Wastes

Paper bags, cardboard boxes, glass bottles, beverage packaging boxes, metal beverage cans, etc. are the packaging wastes included in the domestic-type solid wastes.

Waste Oil

Waste lubricating oils are included in the category 13.02.08 of other engine, gear and lubricating oils of Appendix IV of the Regulation on General Principles of Waste Management, promulgated in the Official Gazette issue no. 26927 on 05.07.2008.

There shall be some vegetable waste oil generated by the existing dining hall within the scope of the project.

Hazardous waste

Hazardous wastes generated within the scope of the project are oils, fuels, empty oil cans, and oakum, gloves, clothes, etc. contaminated with chemicals such as paint, all kinds of materials, paint cans, fluorescent lamps, electrical cables, etc. In addition to this catalysts which have depleted their operating life and leach cake will be ocuured in the facility.

End-of-life tires

End-of-life tires generated within the scope of the project are the unusable tires which may come out of construction machines.

Medical waste

Medical waste to be generated within the project area shall be caused by the infirmary, which is already installed for the workers to be employed.

Waste batteries and accumulators

There shall be some waste batteries and accumulators generated due to machined to be operated during the facility construction phase.

Excavation waste

Excavation waste to be generated during the construction phase is composed of wooden mold residuals, iron residuals, unusable construction materials, etc.

6.6.Flora ve Fauna

6.6.1.Phosphate Mine Sites

Natural habitat characteristics of İR 33838numbered business license areawere eliminated because of production in previous years. In İR 83221 numbered business license, production was not conducted. Therefore, in this area, vegetablo soil excavation will be done firstly. Vegatble oil ill be stored temporarily. It will be covered with meadow-pasture vegetation in order to prevent erosion. The storing height will not e exceed to 5 m andslope will not be aabove 5%.

Blasting operations will be conducted in both areas. Fauna species will affest from the noise made in blasting. As a result, fauna will be replaced to alternative living areas.

6.6.2. Phosphate Concentrator Facility

Concentrator facility was opened to use years ago and it exosed to anthropogenic effects. Therefore, native fauna and flora properties was lost. Fort his reason, any specific species will not be in danger. In addition to this, landscaping Works on the are will be conducted and existing flora will be provided. The photographs shows that existing facilities are given in **Annex-20**.

6.6.3. Integrated Fertilizer Facility

6.6.3.1.Construction Phase

During te construction phase main risk factors on flora and fauna are gas and dust esiions from construction equipments anf dust emission from excavation Works. Additionally noise will be risks for fauna, too. However, with temporary construction Works and small emission levels, a significant effect wll not be occured.

5.6.3.2. Operation Phase

During te operation phase main risk factors on flora and fauna are stack gas emissions. The emission level will be reduced with dry and wet flue gas cleaning systems and filters. Therefore, these will not be signficant effect.

6.7.Demography

80 personnel in the phosphate mines and 225 personnel in the cncentrator facility will be employed. In construction phase of Integrated Fertlizer Facility 500 people will be worked and in operation phase, 526 personnel will be employed.

With the commissioning of the plant, new opportunities will be mad efor economy and employement. Employement will increase gradually. Migration movements to central distrisct and other province will decrease.

Ecenomic input will provided with revenue of people who will work at the facilities and their commercial services received suh as acommodation, food and clothing material etc. Throuhg the pproject activities related to production in many sub-sectrs will be increased.

Hence, income level will rise and commercial activities will facilitate movement. Income resources of local people will increase by employing local people especially in construction phase.

6.8.Occupational Health and Safety

Noise and dust occurance are most important problems for health and environment. Additionally, work related accidents based on using equipments and fires will be possible risks.

Carelesnes, failure to comply safety precautions, not using chemicals according to their MSDS will allow to work-related accidents, too. Prevention ways of all these accidents and measures taken s given detailly in next section.

7.MITIGATION MEASURES

7.1.Emissions

- New areas will be opened up when absolutely necessary to prevent dust emission.
- Ne equipments such as conveyor systems will be preferred as covered.

- Application of a dust suppression system with pressurized and pulverized water in the work areas and moisturizing them with sprayed water shall be ensured by a vehicle to be allocated for this job.
- Since the dust emission would be prevented by using water, the operating of spraying water shall be implemented throughout the construction works which would simultaneously start with the water spraying operation.

- Dust from phosphate rock grinding will be recovered through use of properly operated and maintained filters and cyclones.
- The wet process, which is the most commonly used in fertilizer plants, where phosphate rocks are digested with an acid. The facility will be operated wet system. Covered conveyor belts and indoor storage will be installed.
- Gaseous fluoride emissions will be treated using scrubbing systems (e.g. void spray towers, packed beds, cross-flow venture, and cyclonic column scrubbers).
- After gases generating at the granulation drum at the facility would be washed first at the granulation gases washing pipe and then at Washing Towers II and III, they would later be absorbed by a fan and released into the atmosphere from the stack. The dusty combustion air absorbed from the drying drum would be likewise washed and released into the atmosphere from the stack. In addition, dusts contained in the cooling air at the cooling tower at the facility, dusts contained in the cooling air at the fluidized bed cooler and dusts absorbed from the apparatuses at the facility (elevators, conveyors, crushers, sieves, etc.) would be separately filtered and retained.
- S02 gas would be taken through the cyclones after the waste heat boiler so that it would be ensured that a portion of ash and dust inside it would further be retained. S02 gas comes to the electro-static filter from the cyclones. Here, ash and dust particles remaining inside the gas are settled by means of high voltage so that they are purged from S02 gas.
- In sulphuric cid poduction process, Gas temperature is 900 - 950 0 C while entering the waste heat boiler. Using this heat, about 35 MWe/125 MWt of electricity would be generated.
- Acid scrubbing and cleaning systems will be installed to remove physical and chemical pollutant.

- Sulphuric acid production will be made as double contact-double absorption. Technology choices will be considered to reduce gas volumes and increase SO2 concentration.
- Fluorine, released during the digestion of phosphate rock and during the concentration of phosphoric acid, will be removed by scrubbing systems;

- Dust emissions will be controlled by filters and cyclones.
- Implement process control systems will be implemented to ensure consistent operation
- Process equipment and vessels will be enclodes to prevent fugitive emissions.
- The catalysts will be chosen that minimize side reaction and maximize product concentration.
- The equipment using in transferring of material will be covered.
- Monitoring systems will be installed to follow exiting gass values.
- The plant will be equipped with pre-condensers that remove water vapor and sulfuric acid mist, and with condensers, acid scrubbers, and water scrubbers that minimize the release of HF, SO2, and CO2 from the tail-gas
- there shall be strict compliance with the provisions of Air Quality Assessment and Management Regulation which took force after it was issued in the Official Gazette Issue No 26898 of 6/6/2008, “Regulation on the Control of Industrial Origin Air Pollution” which took force after it was issued in the Official Gazette Issue No 27277 of 03.07.2009.

7.3.Noise

- The noise level which would generate would be higher than the limit value set forth by the regulation and in order to eliminate any adverse effects of the noise level on the staff, it shall be ensured that the staff would use labour clothes and gadgets such as earplugs, gloves, goggles, masks, helmets, etc., and again, the provisions stipulated by Article 78 therein shall be strictly complied with. In addition, the members of staff who would be employed shall be prevented from being exposed to noise for extended periods. However, the construction machines shall be kept in a well maintained condition all the time and there shall be strict compliance with the provisions of the Regulation on Assessment and Management of Environmental Noise and Labour Health and Worker Safety Ordinance which took force after it was issued in the Official Gazette Issue No 14765 of 11.01.1974 with respect to the issue of noise.
- Equipment will be provided to isolate as much as possible. Equipment will be installed in closed building as much as possible.

7.4.Water Usage and Waste Water

- There will be an industrial waste waater treatment system to treat process waste water. The process water will be reused in the system after treatment.
- Domestic waste water will be reused for irrigation of roads in the Project area after treatment.
- In the scope of the project, the standards, which are set forth by the Regulation on the Control of Water Pollution, which took force after it was published in Official Gazette Issue No 25687 of 31.12.2004 and Annex 5 to Law No 1380 on "Aqua Products" shall be strictly complied to.
- There are two seasonal river in the vicinity of Project area. The layout plan was planned according to these rivers' increasble flow rate. A "Factory Flood Plan" will be prepared with taking opinions of DSİ 10. Regional Directorate. Any mitigation measures for flood will be taken by Project owner.
- Any risk of flood for the Project Area would be out of the question if the drainage systems to be made for the facility would be considered in connection therewith. However, the provisions of Prime Ministry Communiqué No 2006/27 titled: "Brook Beds and Floods" shall be strictly complied to.

7.5.Waste

- The main waste are solid waste based on personnel an process in mine sites.. Domestic type solid waste will be sent to an area designated by Mazıdağı Municipality by means of straight trucks without polluting the environment.
- Maintenance of any mechanical equipment to be used during production shall be caused to be made regularly and in connection with any Waste Oils which would generate accordingly, waste management shall be achieved in such a manner and to such an extent ensuring that such waste generation could be minimized pursuant to the Regulation on the Control of Hazardous Wastes as regards Waste Oils and Regulation on the Control of Waste Oils, which took force after it was issued in the Official Gazette Issue No 26952 of 30.07.2008 as regards Waste Oils again and such types of wastes shall be temporarily stored in impermeable tanks and sent to the licensed disposal facilities according to the analysis results in connection therewith.
- Ash which is separated from S02 gas in the waste heat boiler, cyclones and electrostatic filter would be transported to a rotary cooler. Here, the ash cooled down is pelletized if necessary and then pyrite ash would be stored at the storage site; after cobalt, copper and zinc contained in it are removed in the leach unit, it would be sold to the factories as a cement additive.
- Samely, phosphogypsum will be assessed as sales production to cement plants. If saling is not possible, it will be analyzed and the situation of hazardous, nan-

hazardoue and inert waste will be determined. According to analysis result, suiatble storage area will be designed.

- Unusable tires which may come out of construction machines are disposed by delivering licensed recover facilities in accordance with the provisions of the "*Regulation on Control of End-of-Life Tires*" promulgated in the Official Gazette no. 26357 on 25.11.2006.
- Hazardous wastes generated within the scope of the project (oils, fuels, empty oil cans, and oakum, gloves, clothes, etc. contaminated with chemicals such as paint) are deposited in sealed containers marked with "*Hazardous Waste*" separately from other wastes in compliance with the "*Regulation on Hazardous Waste Control*" promulgated in the Official Gazette no. 25755 on 14.03.2005. Hazardous wastes are deposited temporarily and dispatched to recovery/disposal facilities by means of licensed transporter companies.
- A contract with a licensed company has been made for vegetable waste oils generated within the scope of the project and these oils are delivered to this company for disposal in compliance with the provisions of the Regulation no. 25791 on Control of Waste Oils dated 19.04.2005.
- In case of excavation waste generated within the project area, the provisions of the "*Regulation on Control of Excavation Soil and Construction and Demolition Waste*" promulgated in the Official Gazette issue no. 25406 on 18.03.2004 shall be complied with.
- The provisions of the "*Regulation on General Principles of Waste Management*" promulgated in the Official Gazette no. 26927 on 05.07.2008 are complied with throughout the construction phase within the scope of the project.

7.6.Flora and Fauna

- The main risks in mine sites is habitat changing. This changing can be occured with blasting, excavation of vegetable oil, ore production etc.
- Excavation of vegetation soil will be conducted only ore-producing areas. Rhe all area will not be destroyed unnecessarily.
- Foloowing the completion of production activities, rehabilittion and restoration Works will be conducted in the fields.
- In case of any cultural entity, the closest Provincial Directorate of Culture and Tourism and Gendarmerie authorities will be notified.
- The stripped vegetble soil will be stored temporarily in order to use for rehabilitation and restoration Works in future.

7.7.Occupational Health and Safety

Occupational health and safety issues ocur during all phases of the mine cycle can be calssified as following categories.

-Use of hazardous substances and explosives
-Physical hazards
-Noise and vibraton

Use of hazardous substances and explosives:

- The chemical will not be used except blasting activities in mine sites.
- The explosive material using will be conducted according to their Material Safet Data Sheet.
- The blasting activities will be announced before implementation.
- The explosive material using will be conducted by professionals.
- Using, handling and transporting explosives will be conducted in accordance with local and/or national explosives safety regulations.
- Specific warning devices (e.g. horn signals, flashing lights) and procedures will be implemented before each blasting activity to alert all workers and third parties in the surrounding areas.
- Blasting sites will be checked post-blast by qualified personnel for malfunctions and unexploded blasting agents, prior to resumption of work.

Physical Hazardous:

- The personnel will be educated according to their profession.
- Safety barriers will be installed in high-risk locations of internal roads/transport corridors.
- The workers will be issued with high visibility clothing.
- Reflective markings will be used on structures.
- The health protection strip was determined as 250 m on İR 33838 numbered business licence. Samely, the health protection strip will be determined for İR 83221 numbered business licence. Determined health protection strip will be kept. The strip will be catched the attention by local people in the closest residental with installed signboards.

Noise and Vibration

- Maintenance and repair of constructon equipments will be built at time. Hence, excessive noise occurance will be prevented.
- Personnel will use earmuff to affect from noise less.

The possible mitigation measures in Integrated Fertilizer Facility are listed below.

- Hazard analysis studies will be condcted to review process chemistry and engineering practices, including thermodynamics and kinetics. These tests will be made before begining to operation.
- Operating instructions and emergency responce procedures will be developed.
- The personnel will be educated for chemicals, acids, acid mists and technical equipments.
- The gas detectors will be installed in hazar areas.
- Adequate ventillation ill be provided in all areas where products are produced, stored and handled.
- Storage areas will be cleaned before any fertlizer is introduced. Spillage will be cleared up as soon as practicable. Fertilizer contamination with organic substances during storage will be prevented. Fertilizers will not be stored in proximity of sources of heat, or in direct sunlight.
- Contact of phosphoric acid with ferrous metal component will be prevented.
- Stainless steel will be used for components possibly in contact with the acid.

8.PUBLIC CONSULTATION

A public consultation meeting was conducted in the scope of National EIA process. Related to EIA Regulation Article 9, in order to take comments/suggestions from public, a Public Consultation Meeting was organized. The meeting was held on 14.05.2013 at 14:30 in Mardin Mazıdağı Facilities' Refectory by Mardin Provincial Directorate of Environmental and Urban Planning.

Before the meeting, announcements has been made via national and local newspapers. In addition to this, announcement letter was sent to Mardin Provincial Directorate of Environmental and Urban Planning. The brochures were hand out, the public was informed and the suggestions and comments were taken

Provincial Directorate of Environmental and Urban Planning, Headmen of Kovakent Village, Balpınar Village, Gümüşpınar Village, Karataş Village, Ekinciler Village, Şanlı Village and Karaalanı Village, EN-ÇEV ENERGY ENVIRONMENTAL INVESTMENTS CONSULTANCY INC. and local people were joined to the meeting. A presentation was made in order to introduce the Project in the meeting.

Local people wanted to information about measures during extracting mine from the ground and environmental impacts because of solid and liquid waste. The simple explanations were made to eliminate any concerns.

The photographs of meeting are given below.

Figure 65 Public Consultation Meeting (View 1)

Figure 66 Public Consultation Meeting (View 2)

Figure 67 Public Consultation Meeting (View 3)

In addition to meeting in the scope of National EIA Regulation, a new meeting organisation will be conducted providing International Standards after Environmental and Social Impact Assessment Process.