POLATLI MUNICIPALITY
WATER TREATMENT (SOFTENING)
PROJECT
ENVIRONMENTAL MANAGEMENT PLAN

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PROJECT NO: 049 – 01

FEBRUARY 2006

REPORT APPROVAL

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ABBREVIATIONS

EU: European Union
AYP: Waste Management Plan
MINISTRY: R.T. Ministry of Environment and Forestry
MUNICIPALITY: Polatlı Municipality
ÇED: Environmental Effect Assessment
ÇYP: Environmental Management Plan
ÇGDY: Assessment and Management of Environmental Noise
DB: World Bank
DOKAY: DOKAY Mühendislik ve Danışmanlık Ltd. Şti.
Fs: French hardness
HBT: Meeting for Informing Public
İB: İller Bankası
KAKY: Regulation on the Control of Solid Wastes
KÖP: Pollution Prevention Plan
MSDS: Material Safety Data Form
CONTRACTOR: The contractor who will carry out the construction works of the project
PROJECT: Polatlı Municipality Potable and Use Water Softening Project
SKKY: Water Pollution Prevention Regulation
TAKY: Regulation on the control of Hazardous Wastes
ÜÇER: ÜÇER Müşavirlik ve Mühendislik A.Ş.
MANAGER SUMMARY

Polatlı Municipality has entered into a protocol with İller Bank, in order to develop a project that will be credited by the World Bank, in order to soften the existing potable water. “Potable and Use Water Softening Project” has been developed within the frame of the protocol mentioned herein above so as to decrease the existing hardness of raw water, which is currently 50 French Hardness (Fs) down to 17 Fs. Within this context, ÜÇER Müşavirlik ve Mühendislik A.Ş. has prepared a treatment facility project, which includes nano-filtration method in addition to the classical raw water treatment techniques. This treatment facility shall be constructed at the existing raw water treatment facility area near Yüzükbaşı village, which is 80 km southern of Polatlı district center.

This Environmental Management Plan (ÇYP) has been prepared by DOKAY Mühendislik ve Danışmanlık Ltd. Şti. (DOKAY) for this project, which is seen as a requirement of the protocol signed with İller Bankası. Within the frame of ÇYP, a series of precautions are offered in order to remove or minimize the environmental effects that may be caused by the activities to be performed at the construction and operation stages of the project. These effect – decreasing precautions are determined taking into account both the national legislation and World Bank criteria. The socio – economic condition and land utilization forms at the project site are taken into consideration in the choice of the environmental effect assessment and effect – decreasing precautions. In this context, because of the importance of irrigation in the agricultural activities performed in the region and the use of Yüzükbaşı brook, to which the process waste water will be discharged, as the irrigation water source, special care is paid to the change in the quality of the brook water.

As is the case for all projects, in which the World Bank credit is used, a public informing meeting shall be held by the construction contractor in cooperation with Polatlı Municipality in order to present this project to the local public and to obtain the opinions of non governmental organizations that may be related with the subject. The details relating to this meeting and the explanations relating to the public relations works to be carried out at the operation stage are presented in ÇYP.

As the result of the assessments made during the preparation of ÇYP, since the existing water treatment facility area will be used for the construction of the new facility, and the construction works, in which approximately 40 people will be employed, will not require any special activity other than the classical methods, it is envisaged that the environmental effects that will occur at the stage of construction will be at a limited level and that irreversible negative effects will not occur.

At the stage of operation, during which a total of five people will be employed, the environmental issue that is highlighted at the stage of operation is the concentrated waste water discharge caused by nano – filtration process. This matter has been assessed under the relevant legislative provisions. Consequently, it is envisaged that no change will occur in the irrigation water class of Yüzükbaşı Brook after the discharge (C_{30}S_{1}), in comparison with the class before the discharge.

In order to obtain and sustain a healthy environmental performance during the execution of the project, both the construction contractor and Polatlı Municipality shall perform the duties in terms of environmental monitoring. At the stage of construction, the contractor shall prepare an environmental monitoring report each month and shall submit it to the Municipality. In the operation period, Polatlı Municipality shall prepare an environmental monitoring report once every six months and shall submit it to İller Bank.

In case of compliance with the matters included in the ÇYP prepared by DOKAY and the conditions included in the Process Technical Specifications included in the tender documents prepared by ÜÇER, it is envisaged that the environmental performance of the proposed project will comply with both the national environmental legislation and the criteria of World Bank.
1 RESPONSIBLE PARTIES

Polatlı Municipality (MUNICIPALITY) has signed a protocol with İller Bank (İB) in order to develop a project to be credited by the World Bank for softening the existing potable water. “Potable and Use Water Softening Project” (PROJECT) has been developed within the scope of this protocol. In this context, ÜÇER Müşavirlik ve Mühendislik A.Ş (ÜÇER) has prepared a treatment facility project including nano–filtration method in addition to the classical raw water treatment techniques for the MUNICIPALITY.

As a credit condition, DB requests the preparation of an Environmental Effect Assessment (ÇED) Report and / or Environmental Management Plan (ÇYP) in relation to the projects envisaged among the matters presented to İB. Which of these documents will be prepared for the Projects is determined depending on the category (A, B and C) to which the relevant project is subject in accordance with DB criteria. In this context, the PROJECT developed by the MUNICIPALITY is assessed among the projects, for which ÇYP must be prepared in accordance with DB criteria (Category B). ÇYP has been prepared by DOKAY Mühendislik ve Danışmanlık Ltd. Şti (DOKAY).

Within the frame of ÇYP, the precautions recommended in relation with the determination of the possible environmental effects that may occur during both construction and operation stages and to minimize or completely remove such effects and the planning principles relating to the public meetings to be held with the local public and local non-governmental organizations are presented.

The explanations relating to the responsible parties of the PROJECT are given hereunder:

- **DB**: shall review all activities related with the PROJECT it will finance and shall give a “no objection” statement for the appropriate activities or recommend the areas where reinforcement is necessary.

- **İB**: shall perform the quality assurance function in relation with compliance with DB requirements for ÇYP that must be prepared as a requirement of the received credit. İB shall assess whether the prepared ÇYP is compliant in terms of format and content and shall inform DB.

- **ÜÇER**: ÜÇER, which is the firm that performed the feasibility studies of the PROJECT, is responsible for carrying out the projection works in compliance with the requirements of İB, and hence of DB.

- **DOKAY**: is responsible for preparing the ÇYP document of the PROJECT in compliance with the format given by İB.

- **Polatlı Municipality**: is the beneficiary of the envisaged project and is responsible for obtaining the necessary permissions for the construction of the project and is also responsible in front of both İB and R.T. Ministry of Environment and Forestry (MINISTRY) for the application of the environmental precautions indicated in ÇYP during the construction and operation stages. In this context, the MUNICIPALITY shall inform İB and MINISTRY in terms of compliance with ÇYP by preparing an Environmental Monitoring Report once every six months.

- **Construction Contractor (CONTRACTOR)**: shall take the necessary precautions presented in ÇYP in order to minimize the possible environmental effects during the execution of the PROJECT and shall make public meetings recommended within the frame of ÇYP. He is responsible in front of the MUNICIPALITY in relation with this issue.

- **R.T. Ministry of Environment and Forestry**: In case Polatlı Municipality does not comply with the requirements of ÇYP, the MINISTRY shall apply articles 18 and 19 of

This ÇYP, which is prepared as a requirement of the international credits provided by DB, shall be supported with a series of sub plans, as is the case for similar infrastructure projects financed by DB. In this context, Waste Management Plan (AYP) and Pollution Prevention Plan (KÖP) shall be prepared by the CONTRACTOR together with the final ÇYP and shall be put into application. General information related with this AYP and KÖP is given hereunder:

### 1.1 Waste Management Plan

Waste Management Plan (AYP) shall give the methods for i) collection, ii) storage, iii) treatment and / or removal methods within the frame of the waste types that may occur during the construction and operation stages of the PROJECT and the waste management applications for such wastes.

Main references to be used during the preparation of AYP are: Pollution Prevention and Abatement Handbook issued by DB in 1998 and the regulations of the national legislation issued by the MINISTRY and related with the wastes as given in Chapter 3.

### 1.2 Pollution Prevention Plan

Pollution Prevention Plan (KÖP) shall determine the precautions necessary for preventing or minimizing environmental pollution that will be caused by the PROJECT activities and the details relating to which kind of intervention shall be made in case of a pollution that occurred. Planning relating to the following matters has to be performed within the frame of KÖP:

- Fuel storage and use,
- Protection of surface and underground water resources,
- Control of dust and other air polluters, and
- Noise control

### 2 DEFINITION OF THE PROJECT

#### 2.1 Place of Project

Construction of a raw water treatment facility at a distance of 5 km to Yüzükbaşı Village, which is 80 km southern of Polatlı District of Ankara Province, within the frame of “Potable and Use Water Softening Project” (PROJECT) by Polatlı Municipality (MUNICIPALITY). This facility shall be constructed in the area of the existing water treatment facility, which is within the neighboring area of Polatlı Municipality. The location of the project is given in Figure 2.1.
2.2 Socioeconomic Condition of the Locality

Polatlı district is 75 km western of Ankara and is located on Ankara – Eskişehir State Highway. Furthermore, railway passes through the district center. The region including the district center carries all characteristic features of Internal Anatolian Region. Land climate prevails in the area. In other words, the summers are arid and hot and winters are cold and precipitating. Highest precipitation level occurs in spring.

In accordance with the results of 2000 census, the population of the district center of Polatlı is 79,992 and the general population of the district is 116,400. The population of Yüzükbaşı village, which is the nearest residential unit to the PROJECT is 407 in accordance with 2000 census.

The district population provides their income from agriculture and industry. The district has 30,693 hectares of irrigated, 183,500 hectares of non-irrigated area, which corresponds to a total of 214.193 hectares. On the agricultural land around Yüzükbaşı village, approximately 300 ha area is being irrigated using the Rain Irrigation Facility constructed in 2004 by General Directorate of Rural Works. The most produced agricultural products of the region are wheat, barley, sugar beet, melon and onion. The main industrial facilities are brick, tractor, gear industry and similar facilities. Furthermore, stockbreeding can also be indicated as an important source of income. In the light of the data obtained from Ankara Agriculture Provincial Directorate, the distribution of the land asset of the district is as follows:

- 67.75% agricultural area,
- 17.15% grass and pastures,
- 16.68% out of agriculture and
- 0.41% forest and shrubbery.

The district is an important region in terms of cultural assets. Yassihöyük village and its surroundings, which is 20 km northwestern of Polatlı district center is very important in terms of archeological remainders. There are 86 recorded tombs and king graves in Polatlı District.

2.3 Technical Characteristics of the Project

Within the frame of the PROJECT, it is targeted to decrease the water hardness of the existing potable water of Polatlı Municipality, which is currently about 50 French hardness (Fs). The quality parameter values relating to the raw water provided from a spring near Yüzükbaşı Village are given in Table 2.1. In order to decrease hardness, within the frame of the feasibility studies performed in 2005, the following options are examined and nano-filtration method has been chosen among them:

- Chemical softening,
- Reverse osmosis,
- Ion replacement,
- Nano-filtration and
- Ultra-filtration

At the stage of feasibility, the methods listed herein above have been examined in detail in terms of their process efficiency and first investment and operation costs and it has been decided that the most appropriate system for the project is nano-filtration.
Table 2.1 – Water Quality Parameter Values of Yüzükbaşı Spring

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<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
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<tr>
<td>pH</td>
<td>Mg/lt</td>
<td>7.65</td>
</tr>
<tr>
<td>TDS</td>
<td>ppm CaCO₃</td>
<td>795</td>
</tr>
<tr>
<td>P. Alkalinity</td>
<td>ppm CaCO₃</td>
<td>0</td>
</tr>
<tr>
<td>M. Alkalinity</td>
<td>ppm CaCO₃</td>
<td>312</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>ppm CaCO₃</td>
<td>40</td>
</tr>
<tr>
<td>T. Hardness*</td>
<td>ppm CaCO₃</td>
<td>464</td>
</tr>
<tr>
<td>Calcium</td>
<td>ppm CaCO₃</td>
<td>200</td>
</tr>
<tr>
<td>Magnesium</td>
<td>ppm CaCO₃</td>
<td>264</td>
</tr>
<tr>
<td>Sodium &amp; Potassium</td>
<td>ppm CaCO₃</td>
<td>74</td>
</tr>
<tr>
<td>Chloride</td>
<td>ppm CaCO₃</td>
<td>19</td>
</tr>
<tr>
<td>Sulfate</td>
<td>ppm CaCO₃</td>
<td>191</td>
</tr>
<tr>
<td>Bicarbonate</td>
<td>ppm CaCO₃</td>
<td>312</td>
</tr>
<tr>
<td>Carbonate</td>
<td>ppm CaCO₃</td>
<td>0</td>
</tr>
<tr>
<td>Hydroxide</td>
<td>ppm CaCO₃</td>
<td>0</td>
</tr>
<tr>
<td>Dissolved iron</td>
<td>ppm Fe⁺²</td>
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</tr>
<tr>
<td>Suspended iron</td>
<td>ppm Fe⁺³</td>
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<tr>
<td>Manganese</td>
<td>ppm Mn</td>
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<td>Silicate</td>
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<tr>
<td>AKM</td>
<td>mg/l</td>
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<tr>
<td>Turbidity</td>
<td>JTU</td>
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<tr>
<td>Organic materials</td>
<td>Mg / kmnO₄</td>
<td>1.5</td>
</tr>
<tr>
<td>Boron</td>
<td>ppmB</td>
<td>0</td>
</tr>
<tr>
<td>Phosphate</td>
<td>ppm PO₄</td>
<td>0</td>
</tr>
<tr>
<td>Nitrate</td>
<td>ppm NO₃</td>
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</tr>
<tr>
<td>Nitrite</td>
<td>ppm NO₂</td>
<td>0</td>
</tr>
<tr>
<td>Ammonia</td>
<td>ppm NH₃</td>
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</tr>
<tr>
<td>Total bacteria</td>
<td>piece / ml</td>
<td>50</td>
</tr>
</tbody>
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The following units shall be included in the raw water treatment facility that will be constructed within the frame of the PROJECT:

- Raw water tank
- System feeding pumps
- Feeding line special filtration system
- High pressure pumps
- Special filtration system
- Micro – filtration
- Antiscalant dosage unit
- Nano – filtration unit (membrane technology),
- Cleaning and flushing unit
- Treated water tank and
- Transmission line (for transferring treated clean water to the water tank).

The water that will be taken from raw water tank through the pumps shall be first passed through a special filter system in order to clean it from the suspended solid materials, sedimentation and turbidity. After this special filtration system, which is a pressurized conventional filter system, water shall be passed through cartridge filters for micro filtration. The mesh opening of the membranes to be used in micro filtration shall be 5 μm.

The system shall have 250 m³/hour concentrated waste water output. This concentrated wastewater shall be directly given to Yüzükbaşı brook. After this discharge, the quality parameters of Yüzükbaşı brook shall remain at a level that is appropriate for agricultural activities (see Chapter 4).

3 LEGAL FRAME

In the ÇYP, which has been prepared for the construction and operation stage activities in relation with “Polatlı Municipality Potable and Use Water Hardness Removal Project” (PROJECT), the national and international standards have been taken into consideration.

3.1 National Legislation

The legal requirements that have to be complied with in relation with the abatement of the environmental effects of the activities to be carried out during the construction and operation stages of the PROJECT are included in the laws and regulations listed hereunder:

- Law on Environment numbered 2872,
- Regulation on the Protection of Air Quality (entered into force being published in the Official Journal dated 02.11.1986 and numbered 19269)
- Regulation on Controlling Air Pollution having Industrial Origin (entered into force being published in the Official Journal dated 07.10.2004 and numbered 25606),
- Water Pollution Control Regulation Technical Methods Notification (entered into force being published in the Official Journal dated 07.01.1991 and numbered 25687)

² In order to solve the contradiction in terms of waste water discharge limits between the provisions of Water Pollution Control Regulation and Law on Water Products numbered 1380 and the Regulation on Water Products dated 27.07.1973, the authority relating to discharge standards will be transferred completely to R.T. Ministry of Environment and Forestry with the “Water Directive” that is being prepared within the European Union (EU) compliance process. In this respect, we think that this directive should be taken into consideration in the execution of the PROJECT and operation of the facility.
- Regulation on Pits that will be constructed at locations where it is not possible to construct sewage canals (entered into force being published in the Official Journal dated 13.03.1971 and numbered 13783)
- Regulation on the Assessment and Management of Environmental Noise (entered into force being published in the Official Journal dated 01.07.2005 and numbered 25862)
- Regulation on Noise Control (entered into force being published in the Official Journal dated 11.12.1986 and numbered 19308)
- Regulation on Controlling Excavation Soil, Construction and Demolition Wastes (entered into force being published in the Official Journal dated 18.03.2004 and numbered 25406),
- Regulation on Solid Waste Control (entered into force being published in the Official Journal dated 14.03.1991 and numbered 20814),
- Regulation on Hazardous Chemicals (entered into force being published in the Official Journal dated 11.07.1993 and numbered 21634),
- Regulation on Hazardous Waste control (entered into force being published in the Official Journal dated 14.03.2005 and numbered 25755),
- Regulation on Package and Package Waste Control (entered into force being published in the Official Journal dated 30.07.2004 and numbered 25538),
- Regulation on Waste Battery and Accumulator Control (entered into force being published in the Official Journal dated 31.08.2004 and numbered 25569),
- Regulation on Waste Lubricant Control (entered into force being published in the Official Journal dated 21.01.2004 and numbered 25353),
- Regulation on Medical Waste Control (entered into force being published in the Official Journal dated 22.07.2005 and 25883),
- Law on Pastures numbered 5178 and relevant regulations,
- Law on Forests numbered 6831 and Law on Amending Law on Forests numbered 5192 and relevant regulations,
- Regulation on the Protection and Use of Agricultural Land (entered into force being published in the Official Journal dated 25.03.2005 and numbered 25766),
- Regulation on Soil Pollution Control (entered into force being published in the Official Journal dated 31.05.2005 and numbered 28831),
- Law on Soil Protection and Land Use numbered 5403,
- Application Regulation on Soil Protection and Land Use (entered into force being published in the Official Journal dated 15.12.2005 and numbered 26024),
- Law on Protection of Cultural and Natural Assets numbered 2863 (as amended with the law numbered 5226) and relevant regulations,
- Law on Labor numbered 4857 and relevant regulations,
- Regulation on Worker Health and Safety (entered into force being published in the Official Journal dated 09.12.2003 and numbered 25311),
- Statute on worker Health and Work Safety (entered into force being published in the Official Journal dated 11.01.1974 and numbered 14765),
The legal matters relating to the way of changes that may occur in the irrigation water depending on the waste water discharge that will be made during operation stage and the receiver environment’s being an irrigation water source, in comparison with the construction works having limited effect and a short period (eight months) specific to the project, are given in this part in detail.

The national limit values that must be complied with in waste water discharge are given in Table 3.1 together with the international discharge limit values. The change in the brook water that may occur after waste water discharge and the new irrigation water classification that may occur as the result of this, is made taking into account the “Irrigation Water classification Diagram” given in Water Pollution control Regulation (SKKY) Technical Procedures Notification (see Figure 3.1). With the help of this diagram, it is possible to find the water class between $C_iS_j$ and $C_kS_t$ irrigation water classes. In the diagram given in Figure 3.1, the horizontal axis is divided into four groups in terms of salinity harm and the vertical axis is divided into four groups in terms of sodium harm, which in total corresponds to 16 classes.

Figure 3.1 Irrigation Water Classification Diagram
The explanations relating to the salinity classes included in the graphic (C1, C2, C3 and C4) are given hereunder:

- **C1 (Low salinity waters):** can be used safely in the irrigation of any kind of soil and many plant types.
- **C2 (Medium salinity waters):** used in the irrigation of plants having medium grade endurance against salt. Many plants can be grown with medium grade washing and without need for special operations.
- **C3 (Medium salinity waters):** Can be used in areas, where there is no drainage. Special operations may be necessary even under appropriate drainage conditions. Plants resistant against salt must be chosen.
- **C4 (Very high salinity waters):** not recommended for use in irrigation. In case it is compulsory to use them, special conditions such as the following must be taken into consideration: the soil permeability must be high, an abundant amount of irrigation water must be applied in order to ensure sufficient drainage and washing and growing plants that are very resistant against salt.

In terms of sodium danger, the explanations relating to the irrigation water classes (S1, S2, S3 and S4) included in the diagram are given hereunder:

- **S1 (Low Sodium Waters):** Can be used safely for all types of soil and for many plants in general. But sodium accumulation may occur on fruit trees with stone cores, which are sensitive to sodium.
- **S2 (Medium sodium waters):** may be used in coarse – structure soils or organic soils with a good permeability. In cases where there is no gyps in the soil, especially under low washing conditions, sodium damage may occur in thin – structure soils having high – cation change capacity.
- **S3 (High sodium waters):** can be used with organic material addition under good drainage and excessive washing conditions. Can also be used for soils with gyps or with the application of chemical improvement materials.
- **S4 (Very High sodium waters):** generally not appropriate for irrigation other than the cases of low and medium salinity conditions. But they can be used in case of application of calcium solution, gyps and other improvement materials on the soil.

For the calculation of the SAR value necessary for the use of this diagram, the following formula, which is included in SKKY Technical Procedures Notification, is presented.

\[
SAR = \frac{C_{S-Na}}{\sqrt{C_{S-Na} + C_{S-Mg}}} \\
\]

- \(C_{S-Na}\): Sodium concentration in the brook after discharge (mg/L)
- \(C_{S-Ca}\): calcium concentration in the brook after discharge (mg/L)
- \(C_{S-Mg}\): magnesium concentration in the brook after discharge (mg/L)

The assessment made in the light of the information given herein above and the legal requirements about the wastewater to be produced in the operation period and relevant irrigation water quality changes is included in Chapter 4.2.2.1.
3.2 International Criteria

Since the PROJECT is financed within the frame of a credit provided by DB to İB, the environmental criteria of DB are used in the PROJECT. The air polluter emissions, which is included in the “General Environmental Guidelines” document, which is a part of the Pollution Prevention and Abatement Handbook issued by DB for this purpose, and which must be used for this PROJECT, the limit values that must be complied with about issues such as waste water discharge and noise and similar matters are indicated hereunder. Among these limit values and the limit values included in the national legislation, the strictest ones shall be taken into consideration.

3.2.1 Air Quality

Due to the dusting problem that may occur during the construction works, the daily average limit value that must be complied with for PM$_{10}$ for the environmental air quality in the measurements to be performed at the borders of the PROJECT area is 70 µg/m$^3$. Hence, the limit value of DB is stricter and the environmental performance for dusting in the PROJECT shall be monitored basing on this value.

3.2.2 Water

The limit values given in the “General Environmental Criteria” in relation with the discharge of the process waste water, domestic waste water and dirty surface flow waters to the receiver water environment are given in Table 3.1 together with the national limit values. When these DB limit values and national limit values are compared, it is necessary to take the national legislation values into account since there are discharge standards specific to the PROJECT.

3.2.3 Solid Wastes

For the management of solid wastes, the matters included in DB criteria are listed as follows:

- Supporting the regaining of the area as much as possible as a principle, and
- For the solid wastes that are left from regaining and that must be removed, acting in compliance with the national legislation (see Chapter 3.1).

3.2.4 Noise

At the sensitive receiver that is closest to the PROJECT area, limit values that are 55 dBA for daytime (07:00 – 22:00) and 45 dBA for nighttime (22:00 – 07:00). In addition to the compliance with these limit values, the increase in the background noise level at the receiver shall not be more than 3 dBA (equivalent sound level $L_{eq}$) due to the construction and operation activities. The limit values prescribed by DB for day and night time are 5 dBA less than the values included in the Turkish legislation and DB values must be taken into consideration in terms of environmental performance during the operational stage of the project. Since there is no DB criterion for the construction stage, national legislation shall be complied with (see Chapter 4.1.3.5).

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3 For this purpose, the Pollution Prevention and Abatement Handbook prepared by WB in 1998 is taken into consideration. The matters included in the handbook supports the protection of human health, decreasing the amount of polluters released to the environment, use of technology that is commercially proven and that has price advantage, the follow up of national and international legislation and best engineering and environmental management applications.
Table 3.1 – Process Waste water, Domestic Waste water and Dirty surface flow water discharge limit values

<table>
<thead>
<tr>
<th>Parameters</th>
<th>DB values</th>
<th>SKKY Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6-9</td>
<td>6-9</td>
</tr>
<tr>
<td>BOI (mg/L)</td>
<td>50</td>
<td>-</td>
</tr>
<tr>
<td>KOI (mg/L)</td>
<td>250</td>
<td>100</td>
</tr>
<tr>
<td>Petroleum and oil (mg/L)</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>Total SSM (mg/L)</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Total heavy metals (mg/L)</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>Arsenic (mg/L)</td>
<td>0,1</td>
<td>-</td>
</tr>
<tr>
<td>Cadmium (mg/L)</td>
<td>0,1</td>
<td>-</td>
</tr>
<tr>
<td>Chrome (+6) (mg/L)</td>
<td>0,1</td>
<td>-</td>
</tr>
<tr>
<td>Total Chrome (mg/L)</td>
<td>0,5</td>
<td>-</td>
</tr>
<tr>
<td>Copper (mg/L)</td>
<td>0,5</td>
<td>-</td>
</tr>
<tr>
<td>Iron (mg/L)</td>
<td>3,5</td>
<td>10</td>
</tr>
<tr>
<td>Lead (mg/L)</td>
<td>0,1</td>
<td>-</td>
</tr>
<tr>
<td>Mercury (mg/L)</td>
<td>0,01</td>
<td>-</td>
</tr>
<tr>
<td>Nickel (mg/L)</td>
<td>0,5</td>
<td>-</td>
</tr>
<tr>
<td>Selenium (mg/L)</td>
<td>0,1</td>
<td>-</td>
</tr>
<tr>
<td>Silver (mg/L)</td>
<td>0,5</td>
<td>-</td>
</tr>
<tr>
<td>Zinc (mg/L)</td>
<td>2,0</td>
<td>-</td>
</tr>
<tr>
<td>Free cyanide (mg/L)</td>
<td>0,1</td>
<td>-</td>
</tr>
<tr>
<td>Total cyanide (mg/L)</td>
<td>1,0</td>
<td>-</td>
</tr>
<tr>
<td>Ammonia (mg/L)</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>Fluoride (mg/L)</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>Chloride (mg/L)</td>
<td>0,2</td>
<td>1500</td>
</tr>
<tr>
<td>Phenol (mg/L)</td>
<td>0,5</td>
<td>-</td>
</tr>
<tr>
<td>Phosphor (mg/L)</td>
<td>2,0</td>
<td>-</td>
</tr>
<tr>
<td>Sulfate (mg/L)</td>
<td>1,0</td>
<td>2500</td>
</tr>
<tr>
<td>Coli form bacteria</td>
<td>&lt;400 MPN / 100 ml*</td>
<td>-</td>
</tr>
<tr>
<td>Increasing temperature</td>
<td>&lt;3°C*</td>
<td>-</td>
</tr>
</tbody>
</table>


*MPN – Most probable number

a- at 100 m downstream of the discharge point
4 MITIGATION PLAN

In this section of ÇYP, effect mitigating precautions that are proposed in order to decrease important environmental effects that may occur on water, air, soil and other receiver environments at the construction and operation stages of the PROJECT.

4.1 Construction Stage

4.4.1 General Environment

ÜÇER firm carrying out the engineering studies of the PROJECT also prepares the tender documents necessary for the construction tender. Hence, this ÇYP, in which the environmental effects that may occur in the construction stage of the PROJECT are assessed and effect – decreasing precautions are proposed, shall be submitted to the bidder firms before the proposal, together with these tender documents. The main responsibilities of the CONTRACTOR, who will be determined with the tender and who will carry out the construction works of the PROJECT, are given hereunder:

- Assigning an engineer, who will ensure the application of ÇYP as the responsible personnel for “Health, Safety and Environment” (HSE) and following up the compliance with ÇYP through internal audits,
- In order to provide contribution to the environmental performance of the PROJECT, ensuring that the construction personnel is trained about environment – related issues,
- Complying with the Turkish Environmental Legislation and DB requirements given in Chapter 3 and taking the necessary environmental effect abating precautions in order to prevent the occurrence of an inappropriate condition,
- Obtaining the permissions necessary under the national legislation in order to carry out the construction activities, as given in Chapter 3, and
- Compliance with the new national laws, regulations and international criteria that may enter in force or be issued during the construction stage as well as the existing legal frame.

The construction activities of the project shall be carried out in a small area that is 800 m² and with a small number of workers, which is 40. Furthermore, the area, where the construction works will be performed is within the existing treatment facility area, from where potable water is provided to Polatlı district center currently. For this reason, the CONTRACTOR shall be able to comply with his environmental responsibilities by complying with the relevant national environmental legislation and international criteria. The environmental effects that may be caused by the construction activities of the PROJECT and the effect – decreasing precautions proposed for removing or mitigating them are given in the following chapters.

4.1.2 Possible Environmental Effects

The possible environmental effects that may occur in connection with the construction activities of the PROJECT are handled in accordance with the following topic titles:

- Effects on the water environment,
- Air polluter emissions,
- Solid wastes,
- Noise and
- Protection of public health
4.1.3 Effects on Water Environment and Effect – Mitigating Precautions

At the stage of construction, the working methods shall be chosen so as to prevent surface water pollution. For this purpose, the following matters shall be considered:

- Compliance with “good housekeeping” principles at the worksite,
- Ensuring compliance with all legal requirements and performance of internal audits,
- Control of sediment carriage and erosion, and
- Control of wastewater produced by the construction personnel.

4.1.3.1 Sediment and Erosion Control Precautions

The Contractor shall minimize the soil losses that may occur as the result of sediment carriage and erosion. The purpose here is to prevent the erosion formation and depending on this, decreasing the sediment load going to Yüzükbaşı brook and mitigating the possible stress on the aqua-environment. A surrounding canal shall be formed around the site in order to prevent sediment carriage to Yüzükbaşı brook with the surface flow originating from the site. Furthermore, this canal shall be designed taking into account the overflow rate so as to prevent the entrance to the site of the overflow waters coming out of the site. In order to prevent the negative effect of the water to be given from the canal to the brook quality, a simple waiting or sedimentation (decantation) pool must be constructed.

4.1.3.2 Wastewater control

For the removal of the wastewater to be produced by the personnel who will be employed in the construction activities, it shall be possible to use the wastewater infrastructure used by the existing water treatment facility personnel. In case it will not be possible to use the existing infrastructure, it shall be necessary to open an impermeable cesspit as indicated in article 32 of Water Pollution Control Regulation (SKKY) in order to store the wastewater. In such a case, domestic wastewater shall be removed from the site being drawn from the cesspit with a scavenger to be provided by the MUNICIPALITY.

Worksite Good Housekeeping Applications

The CONTRACTOR shall prevent the discharge of construction materials, excavation wastes and similar wastes to the close receiver water environment. These construction materials include strong polluters such as sand, cement, hazardous waste (for example machine lubricants) and detergents.

Storage of Materials

In case of spilling of the fuel or chemicals that may occur during the maintenance and repair of the work machinery, the construction materials, machinery lubricants and petroleum products shall be stored in an area that is minimum 20 m to the Yüzükbaşı brook shore in order to prevent the possibility of water pollution or to minimize the risk of pollution that may occur.

4.1.3.3 Air Polluter Emissions

The CONTRACTOR shall take the precautions necessary for minimizing the occurrence of the polluter missions caused by the work machinery and transportation vehicles. Within this scope, a series of precautions as given hereunder (but not limited with them) can be taken:

- Performance of maintenance and inspections of the vehicles within the frame of the relevant regulations,
- Limiting the vehicle movements as much as possible, and

---

4 Cesspit shall be constructed in compliance with the conditions of “Regulation on Cesspits to be constructed at locations where it is not possible to construct sewage canals”.

- Not operating the motors of the work machinery while no work is performed.

In addition to the emissions caused by the machinery and vehicles, fuel and similar volatile or semi-volatile materials (gases, paints, dissolvers, oil removers etc) shall be stored in an appropriate way.

Furthermore, the relevant regulations have to be complied with in the choice of the fuel to be used for heating purposes for the workers at the worksite.

In order to prevent the occurrence of dust (PM$_{10}$) which is one of the main factors of the construction works, the CONTRACTOR shall apply the following dust control methods:

- Keeping vehicles to be used for irrigation such as road washing machine at the worksite
- Application of 30 km/h speed limitation on the roads to be used for access to the PROJECT worksite (for this purpose, warning plates shall be placed as necessary on the access road to the site and to the PROJECT site)
- Taking the necessary precautions for cleaning the tires of the worksite vehicles before driving on the main road and following up these operations
- Covering the loaded excavation trucks. And
- Appropriate irrigation during dust-creating operations

When irrigation is performed at the site for the purpose of struggling against dust, care must be paid in order to prevent the reach of dirty water flow to Yüzükbaşı brook and other close surface water resources.

4.1.3.4 Solid Wastes

The CONTRACTOR shall be responsible for the at–resource separation, collection and removal of the waste materials that will be produced during construction activities. The wastes that will be produced at the site shall be separately collected in line with AYP to be prepared by the CONTRACTOR and shall be removed within the frame of the Solid Waste Control Regulation (KAKY) and other relevant regulations (see Chapter 3.1).

Recyclable scrap construction wastes (packaging materials, scrap iron, wood etc) shall be stored separately in a way compliant with KAKY provisions at the PROJECT site, to be sold to the firms in the recycling sector. The CONTRACTOR shall keep records on the type and amounts of the waste materials that are created, stored and removed at the site. This application must be taken into consideration also during the preparation of AYP and details on collection and storage must be included.

In case of performance of the maintenance and repair works of the work machinery to be used in the construction activities, the waste lubricants that may occur shall be kept in a provisional warehouse within the worksite so as to comply with the minimum conditions requested in the Regulation on Control of Hazardous Wastes and shall be removed being given to the organizations authorized by the Ministry.

4.1.3.5 Noise Control

The noise limit values (L$_{day}$ 70 dBA; L$_{cmax}$ 100 dBA) that are included in ÇGDY Regulation and that must not be exceeded shall be complied with at the sensitive receiver locations, in connection with the construction activity. For this purpose, the effect–mitigating precautions envisaged in the same regulation shall be complied with both at the source (for example equipping the work machinery with silencers and curtaining at the high sound sources such as generators and periodic maintenance) and at the receiver point (for example curtaining). The CONTRACTOR shall take a series of managerial precautions as given hereunder in terms of noise control:
• For construction works, not working out of the day hours indicated in ÇGDY Regulation (07:00 – 19:00)
• Locating the noise sources taking into consideration the distance to the sensitive receiver environment, in the site planning
• Not operating the motors of the work machinery when no work is performed.
• Acting with care and limiting the use of warning – purpose sounds such as horns.
• Vehicles having a silencer equipment, and
• Applications such as soil piles and treeing around the PROJECT site for curtaining purposes.

4.1.3.6 Protection of Public Health
Activities threatening or endangering the health of the public living in the surrounding residential locations shall not be performed during the works to be carried out by the CONTRACTOR. In this context, the following issues are important:
• The drivers of the vehicles bringing materials to the PROJECT site or taking materials from the site shall comply with the speed limits,
• Dust and mud accumulation on the roads used for access to the site shall not be permitted, and
• Pouring or spread of any chemical and harmful material that may threaten the public health while passing through the surrounding residential locations during material transportation shall not be caused and the necessary precautions shall be urgently taken in case of possible accidents.

4.2 Operation Stage
4.2.1 General Frame
The MUNICIPALITY shall be responsible for complying with the matters included in ÇYP for the operation stage of the facility, for which the construction is completed by the CONTRACTOR. The CONTRACTOR has to undertake and prove that the conditions for facility acceptance indicated in the tender documents will be and are complied with. In this context, for concentrated wastewater discharge that will be caused by the facility after the commencement of operation, discharge permission must be obtained from Ankara Provincial Environment and forest Directorate. Furthermore, opening license has to be obtained for this type of facility, within the frame of “Regulation on Opening and Licensing Workplaces”. Since this PROJECT is within the neighboring area borders of the MUNICIPALITY, the opening license shall be obtained from the MUNICIPALITY. A revision shall be made on the opening license obtained for the existing treatment facility, which provides water to Polatlı district center, so as to include the new facility.

The following matters have to be complied with by the MUNICIPALITY, or in case the operation is given to a private organization, by the relevant operation firm.
• Assigning an engineer who will ensure the application of ÇYP as the “Health, Safety and Environment” (HSE) responsible personnel and following up compliance with ÇYP through internal audits.
• In order for the operation personnel contribute to the environmental performance of the PROJECT, ensuring that they are trained about environment,
• Compliance with Turkish Environmental Legislation and DB requirements given in Chapter 3 and taking the necessary environmental – effect mitigating precautions in order to prevent the occurrence of an incompliance condition, and
In addition to the existing legal frame, compliance with the new national laws, regulations and international criteria that may enter into force or may be published.

4.2.2 Possible Environmental Effects and Effect – Mitigating Precautions

Depending on the activities at the operation stage of the PROJECT, the issue that is highlighted among the possible environmental effects is the discharge of the concentrated wastewater that will be caused by the nano – filtration process. In this respect, in this section of ÇYP, first the environmental effects that may be created by the wastewater discharge are assessed and effect – mitigating precautions in order to mitigate them are proposed. Thereafter, environmental issues connected with other activities in the operation stage are examined.

4.2.2.1 Waste Water

The possible process wastewater characterization of the PROJECT that is calculated as the result of the engineering works carried out by ÜÇER is given in Table 4.1.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>-</td>
<td>7,9</td>
</tr>
<tr>
<td>total dissolved solid material</td>
<td>mg/L</td>
<td>3.654</td>
</tr>
<tr>
<td>carbon dioxide</td>
<td>mg/L</td>
<td>21,4</td>
</tr>
<tr>
<td>bicarbonate</td>
<td>mg/L</td>
<td>1.727</td>
</tr>
<tr>
<td>carbonate</td>
<td>mg/L</td>
<td>22,0</td>
</tr>
<tr>
<td>calcium</td>
<td>mg/L</td>
<td>376,2</td>
</tr>
<tr>
<td>magnesium</td>
<td>mg/L</td>
<td>301,5</td>
</tr>
<tr>
<td>sodium + potassium</td>
<td>mg/L</td>
<td>146,3</td>
</tr>
<tr>
<td>chlorure</td>
<td>mg/L</td>
<td>61,0</td>
</tr>
<tr>
<td>sulfate</td>
<td>mg/L</td>
<td>865,0</td>
</tr>
<tr>
<td>nitrate</td>
<td>mg/L</td>
<td>7,0</td>
</tr>
<tr>
<td>iron</td>
<td>mg/L</td>
<td>0,07</td>
</tr>
<tr>
<td>silicate</td>
<td>mg/L</td>
<td>83,0</td>
</tr>
</tbody>
</table>


When the quality parameters of the waste water that will be produced by the potable and use water softening facility are compared with the national and international limit values included in Table 3.1 in Chapter 3, it is envisaged that the PROJECT shall not cause any problems in terms of discharge.

Besides the comparison with the discharge limit values, the quality change in the receiver water environment is also assessed within the scope of ÇYP. Yüzükbaşı brook, where the discharge will be made within the scope of the envisaged project is a brook, from which the irrigation water need of the surrounding agricultural lands is met, therefore post – discharge irrigation water class is determined basing on the Electrical Conductivity and Sodium Adsorption Ratio (SAR), which have great importance for irrigation water quality. The assessment made using the diagram in chapter 3 for irrigation water classification is given in the following paragraphs.
Calculations have been made for finding the salinity and sodium values in the irrigation water as the result of the mixture of the process waste water that will be created by the envisaged treatment facility and the brook and depending on this, for using the diagram in Figure 3.1. In these calculations, while taking the flow rate of the brook, the results of the flow rate measurement studies performed by DSİ in the past periods (1976 – 1978, 1981 – 1984 and 1992) and obtained by ÜÇER firm have been reviewed. The lowest of these flow rate values (1.206 L/s) has been measured in August 1976 and the highest value has been measured in October 1982 (2.256 L/s). As the worst case condition must be taken into consideration in the calculations, a minimum flow rate of 1.000 L/s is accepted, which is less than the minimum flow rate value of 1.206 L/sec. Hence, taking into account the possible water withdrawals from the brook, 15% safe side has been kept. It is known that the wastewater flow rate calculated as the result of the engineering studies carried out by ÜÇER is 78 L/s.

For the calculation of SAR value, the formula included in SKKY Technical Procedures Notification and given in Chapter 3 is used. The sodium, calcium and magnesium concentration values were necessary for use in that formula. For this reason, the brook water and wastewater sodium values and flow rate values are used and the sodium values that will occur in the brook after wastewater discharge are calculated with the following formula:

\[ C_{S-Na} = \frac{Q_A \times C_{A-Na} + Q_D \times C_{D-Na}}{Q_A + Q_D} \]

- \( C_{S-Na} \) = sodium concentration after discharge (mg/L)
- \( Q_A \) = waste water flow rate (L/s)
- \( Q_D \) = brook flow rate (L/s)
- \( C_{A-Na} \) = Sodium concentration in the waste water (mg/L)
- \( C_{D-Na} \) = sodium concentration in the brook (mg/L)

\[ C_{S-Na} = \frac{78 \times 146.36 + 1000 \times 40.48}{78 + 1000} \]

\[ C_{S-Na} = 48.14 \text{ mg/L} = 2.1 \text{ me/L} \]

In a similar way, the following results are obtained when the calcium and magnesium values that will occur in the brook water after wastewater discharge are calculated.

\[ C_{S-Na} = 116 \text{ mg/L} = 5.8 \text{ me/L} \]
\[ C_{S-Mg} = 93 \text{ mg/L} = 7.6 \text{ me/L} \]

When the values found herein above are used in SAR formula, the SAR value of the irrigation water is calculated as 0.81. When the SAR values given in the vertical axis of the diagram given in Figure 3.1 are examined, 0-10 range corresponds to low sodium danger, 10-18 range corresponds to medium level sodium danger and 18 – 26 range corresponds to high sodium danger. The value 0.81, which is calculated for the PROJECT shows that no problem will occur in irrigation in terms of sodium of the brook water.

In this diagram, since irrigation water class can be found using Electrical Conductivity and SAR values together, in addition to SAR calculated herein above, Electrical Conductivity value is also calculated. The electrical conductivity value of the brook water after the discharge is found with the method used in the concentration calculations given herein above. As the result of the calculations made taking into account the electrical conductivity value of raw water, which is 1.609 \( \mu \text{S/cm} \) and the electrical conductivity value of the waste water which is 6,200 \( \mu \text{S/cm} \), and the flow rates of these waters, it has been determined that the electrical conductivity value of the brook (irrigation water) after the discharge will be 1.941 \( \mu \text{S/cm} \) as the result of the calculation made.

In this case, it has been determined that the irrigation water class of Yüzükbaşı brook after the concentrated waste water discharge of the envisaged Potable and Use Water Softening Facility using the SAR and Electrical Conductivity values calculated herein above shall be \( C_3 S_1 \) with the help of the relevant diagram. SAR value of the brook water before discharge is
and its electrical conductivity value is 1.609 \( \mu \text{S/cm} \). After the discharge, an increase of 9% and 20% occurs in these values of the brook respectively. The irrigation water class of the brook before discharge is C3S1. Hence, there is no change in the irrigation water quality class depending on the discharge, however there is an increase in SAR and Electrical Connectivity values.

4.2.2.2 Other Issues

The following matters can be given among the issues that may create environmental effects in the operation stage:

- Hazardous chemical storage and use,
- Domestic and hazardous wastes
- Creation of noise due to the equipment to be used in the facility and
- Work safety

The matters indicated herein above can be managed without creating any important environmental problem. In this context, the chemical products used in the facility shall be regularly labeled. For these chemicals, material Safety Data form (MSDS) shall be prepared and hung at the location where they are stored. The employees shall be trained about the use of these materials.

For the hazardous wastes, interim storage and final removal methods compliant with TAKY provisions shall be applied. The removal of the domestic wastes shall be solved through negotiations with Polatlı Municipality, as in the construction period.

The noise levels created by high sound sources such as pumps, centrifuge, power supply etc that will operate at the facility at the operation stage shall be monitored both in terms of the health of the personnel employed in the facility (Noise Regulation of Ministry of Labor and Social Security) and the public living at the close sensitive receiver point (ÇGDY Regulation) (see chapter 5).

In terms of work safety, the operation activities shall be carried out within the frame of the “Labor Law” and “Worker Health and Safety Regulation”. The necessary warning plates and instructions shall be hung at locations visible to the personnel in an appropriate way. Precautions for worker health (for example wearing earphones at necessary locations) shall be taken within the facility.

5 MONITORING PLAN

In “Turkish Municipal Services Project Environmental Frame” document prepared by İller Bankası (İB) for the infrastructure projects making use of the World Bank (DB) credits, it is said that the findings related with the environmental monitoring studies requested within the frame of ÇYP during the execution of the PROJECT and in the operation period should be notified to İB through the use of monitoring reports.

Since the activities for the construction and operation stages of the project are different and hence their possible environmental effects will also be different, the environmental monitoring studies are proposed separately. The data obtained from the monitoring works shall be compared with the national legislation and international criteria given in Chapter 3.

5.1 Construction Stage

It is both non – practical and unnecessary to monitor all environmental parameters. Environmental monitoring serves in an effective way for the determination of the existing environmental conditions and determines the changes that will not be accepted during the construction. In this context, the monitoring plan has been designed to support the thesis
“project activities did not have any negative affect on the environmental sources in a permanent way” and to give such decision.

At the construction stage, the air and water quality and waste management applications and noise levels shall be monitored and the obtained findings will be compared with legal limit values. The CONTRACTOR shall prepare a report in compliance with the following program in relation with the studies about monitoring and shall submit it to the MUNICIPALITY.

- Daily environmental incompliance (if any) report;
- Weekly environmental report (explanation of the environmental problems encountered within the week and the precautions taken); and
- “Monthly Environmental Monitoring Reports” where the environmental performance of the Project is assessed in terms of the requirements of ÇYP.”

5.1.1 Water Quality and Waste Water Discharges

The only receiver water environment that can be potentially impacted during the construction is Yüzükbaşı brook. Samples shall be taken from the brook water by the CONTRACTOR for the determination of the existing condition before commencing construction activities both at the facility construction area, which is close to the brook (30 – 50m) and at the point of discharge to the brook, and dissolved oxygen, turbidity / total suspended solid material, oil – grease and coli form parameters shall be analyzed. During the construction activities, the dissolved oxygen, turbidity / total suspended solid material, oil – grease and coli form parameters shall be analyzed in the water samples to be taken at the points indicated in the sketch given in Figure 5.1 monthly and the environmental performance of the activities shall be monitored. The sampling points shall be determined taking into account the area conditions. The results found during the monitoring activities to be performed during the construction works shall be compared with the time before construction and an increase that will be found reasonable by the Provincial Environment and Forest Directorate shall be permitted. A report relating to the monitoring study carried out by the contractor shall be prepared and submitted to the MUNICIPALITY.

Discharge line

Sampling point

Figure 5-1. Sketch relating to the sampling points

In – situ measurement of the water quality and laboratory analysis shall be performed by “Independent Monitoring Firms” having competence using appropriate site equipment. The samples that will be analyzed out of the site shall be regularly labeled and the necessary records shall be kept.

5.1.2 Solid Wastes

The domestic solid wastes and dangerous wastes occurring at the PROJECT site shall be separately collected and removed in compliance with the legislation. The way of monitoring the solid wastes that will occur at the site shall be indicated in detail in the AYP that will be prepared by the CONTRACTOR and submitted to the MUNICIPALITY.

5.1.3 Air Quality

In relation with the air quality, the most important issue at the construction stage shall be dust (PM10). Dust monitoring shall be mentioned as indicated hereunder:

- Under the Regulation on Protection of Air Quality, control shall be provided for the regular site application related with dust control. During the construction activities, the dust production level shall be assessed by the CONTRACTOR.
• PM$_{10}$ measurements shall be carried out at the borders of the PROJECT site.

In case PM$_{10}$ levels violate the Turkish and/or international standards, appropriate mitigating precautions shall be applied. PM$_{10}$ measurements shall be performed by an “Independent Monitoring Firm”.

5.1.4 Noise

Noise monitoring shall be performed during the works that may create maximum level of disturbance depending on the time of the activity or activities performed. Noise monitoring to be performed during construction shall be performed in Yüzükbaşı village, which has a sensitive location. Noise monitoring study shall be performed with the commencement of the construction activities and during the activities that will increase the noise level. The noise measurement during construction ($L_{daytime}$) shall be performed between 7:00 and 19:00 at a distance of 1.5 m of the house of the village, which is closest to the facility.

The monitoring results shall be compared with the values included in the General Environmental Criteria of DB and Turkish ÇGDY Regulation. In case any standard is violated, the necessary effect mitigating precautions shall be applied by the CONTRACTOR. Thereafter monitoring studies shall continue in order to determine the appropriateness of the applied precautions. Among the precautions, use of noise curtains, change of work method or used materials are included. In case of a change that will increase the noise level during the construction activities or in case work is performed during night after a permission is obtained, monitoring works of the noise – increasing activities shall be repeated.

All noise measurements shall be performed by people, who completed the A – class certificate course requested by R.T. Ministry of Environment and Forests and who are employed in an “Independent Monitoring Firm”, by using calibrated noise level meters. The monitoring firm shall perform noise measurements monthly. Depending on the complaints from the local publics, these measurements can be applied more frequently.

5.2 Operation Stage

At the operation stage of the Project, less environmental effect types are expected, therefore, the frame relating to the monitoring plan at this stage is given in Table 5.1. The MUNICIPALITY shall submit the environmental monitoring works to İB within the scope of a report minimum once every six months.

Table 5.1 – Monitoring Plan

<table>
<thead>
<tr>
<th>Monitoring Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water quality monitoring</td>
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<td>For monitoring concentrated wastewater discharge, the parameters indicated in the discharge permission document shall be monitored with the frequency indicated in that document. The results shall be notified to Ankara Province Environment and Forest directorate and to Iller Bank.</td>
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<tr>
<td>Solid Waste Monitoring</td>
<td>Within the frame of waste monitoring, it is envisaged to keep the daily records of the solid wastes produced at the stage of operation, to assess</td>
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</table>
them monthly and to perform the annual audit of the facility within the frame of the AYP to be prepared.

| Chemical Monitoring | The chemicals brought to the site, stored, used and removed (for example sodium metabisulfite, sodium hypochlorite and antiscalant “PermaTreat 191”) shall be recorded and assessed monthly. |

6 INSTITUTIONAL REGULATIONS

This chapter provides information on how and by whom the environmental monitoring data that will be obtained for making the PROJECT reach a healthy environmental performance will be used.

6.1 Construction Stage

As the PROJECT owner, Polatlı Municipality (MUNICIPALITY) is the party responsible for minimizing or completely removing the possible environmental effects of the PROJECT during the construction and operation stages. In this context, the MUNICIPALITY shall ensure the attachment of ÇYP to the tender documents before the tender that will be held for determining the CONTRACTOR. Hence, the CONTRACTOR shall know his duties in the construction stage for warranting the environmental performance of the PROJECT and shall form his proposal price taking these matters into account. By this way, the environmental performance of the PROJECT will not be endangered with a claim that no information on ÇYP was given, after the tender.

The CONTRACTOR shall perform the following activities in order to ensure the environmental performance in a healthy way.

- Assignment of an HSE responsible personnel for the application and follow up of ÇYP.
- Providing training to the personnel to be employed in construction activities for the purpose of increasing environmental consciousness and obtaining information about the requirements of ÇYP
- Complying with the requirements of ÇYD about issues such as decreasing the emission and noise created by the construction equipment, protecting the water resources, waste management etc and preparation of AYP and KÖP sub plans related with this, and

The CONTRACTOR shall hold a meeting with the local public and Non–Governmental Organizations (NGOs) to introduce the PROJECT and shall commence the public relations process of the PROJECT (see Chapter 7). During the construction activities, a public relations mechanism shall be established for recording and answering the complaints that may come from Yüzükbaşı village and the NGOs and official organizations in the district. This mechanism shall examine the following matters:

- Transferring the developments related with the PROJECT to the public
- Accepting and recording the complaints,
- Fast and effective examination of the complaints and answering them.

During the construction works, the CONTRACTOR shall carry out the environmental monitoring works in accordance with the matters indicated in ÇYP and shall submit his findings to Polatlı Municipality with monthly environmental monitoring reports. The CONTRACTOR has to work with firms to whom Laboratory competence Certificate or Laboratory Prequalification Certificate is issued by R.T. Ministry of environment and Forests
(Independent Monitoring Firm – BİF) during the environmental monitoring works he will carry out.

The MUNICIPALITY shall assess the monitoring reports to be submitted by the CONTRACTOR in terms of the relevant environmental legislation and shall notify them to İB. Furthermore, the MUNICIPALITY shall ensure that a copy of the environmental monitoring reports are kept at both the MUNICIPALITY and at the worksite office of the CONTRACTOR in order to submit it to the authorities during the audits that may be performed by Ankara Provincial Environment and Forests Directorate.

In case of an incompliance that may be determined by the Provincial Environment and Forest Directorate and İB authorities, the CONTRACTOR shall apply corrective activities and shall notify this condition to the MUNICIPALITY with a letter.

The duty distribution related with the works envisaged for the construction stage within the scope of this ÇYP is given in Table 6.1

Table 6.1 – Duty Distribution relating to ÇYP Requirements in the Construction Stage

<table>
<thead>
<tr>
<th>Work item</th>
<th>BİF¹</th>
<th>CONTRACTOR</th>
<th>MUNICIPALITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental quality Monitoring (water, air, soil, noise, etc)</td>
<td>S</td>
<td>Y²</td>
<td>-</td>
</tr>
<tr>
<td>Training of key personnel</td>
<td>S</td>
<td>S</td>
<td>-</td>
</tr>
<tr>
<td>Training of all employees</td>
<td>Y</td>
<td>S</td>
<td>-</td>
</tr>
<tr>
<td>Emergency action plan</td>
<td>Y</td>
<td>S</td>
<td>Y³</td>
</tr>
<tr>
<td>Corrective activities</td>
<td>-</td>
<td>S</td>
<td>-</td>
</tr>
<tr>
<td>Internal audit</td>
<td>Y</td>
<td>S</td>
<td>-</td>
</tr>
<tr>
<td>Reporting</td>
<td>Y</td>
<td>S</td>
<td>-</td>
</tr>
<tr>
<td>Media relations</td>
<td>-</td>
<td>Y</td>
<td>S⁴</td>
</tr>
<tr>
<td>Examining the complaints</td>
<td>-</td>
<td>S</td>
<td>-</td>
</tr>
</tbody>
</table>

¹BİF: Independent Monitoring Firm

² After completing the training of the key personnel, the responsibility of the works shall belong to the CONTRACTOR.

³ MUNICIPALITY may contribute to the application of ÇYP by providing the environmental legislation documents currently in force in Turkey to the CONTRACTOR.

⁴ Under the rules of general application in public investments, the relations with the media are the responsibility of the PROJECT owner (MUNICIPALITY). Therefore, the
CONTRACTOR may not make any direct interviews with the media without the permission of the DIRECTORATE.

6.1.1 Training

The most important issue in order to warrant the general environmental performance of the PROJECT is a continuous training program for increasing the environmental consciousness of the personnel. The environmental training program shall be prepared so as to comply with the following matters:

- Environmental requirements of the PROJECT and Understanding how it will be applied by the personnel at the worksite (For example what kind of environmental effects are expected and what kind of effect – mitigating precautions are proposed, where are those precautions necessary and how are they applied);
- In case of incompliance, fully understanding the procedures that must be followed up,
- Understanding the reporting requirements and the rules
- Informing the official organizations in relation with the environmental dimension of the PROJECT
- Understanding the way of behavior to the media personnel and the public visiting the site and
- Learning how the unexpected environmental accidents will be intervened to.

The CONTRACTOR is obliged to keep the records relating to the environmental training obtained by his personnel. The effectiveness and sufficiency of the training have to be examined through internal audits. The CONTRACTOR has to ensure that the subcontractor firm personnel he will employ is given environmental training and to take this matter into consideration in the contract he will enter into with the relevant subcontractor firm.

6.1.2 Public Relations

6.1.2.1 Relations with the Media

Under the general application rules in public investments, the relations with the media are under the responsibility of the project owner (Polatlı Municipality). Therefore, the CONTRACTOR may not make any direct interviews with the mediate without the permission of the MUNICIPALITY. In case such authority is given to the CONTRACTOR, it will be necessary to prepare and put into application a procedure in connection with such relations.

6.1.2.2 Examining the Complaints

The CONTRACTOR shall prepare a complaint procedure. This procedure shall be prepared so as to ensure that possible complaints or recommendations are directly transmitted to the relevant personnel (Personnel responsible for Public Relations – HIS). The CONTRACTOR is obliged to give his worksite and / or office telephone numbers, electronic and normal mail addresses relating to HIS to the relevant groups (local public and NGOs) for the acceptance and recording of complaints related with the construction activities.

Each received complaint shall be recorded under the relevant procedure and notified to the relevant technical personnel employed at the worksite by HIS for taking the necessary precautions and corrective activities. When the necessary precautions are taken and the environmental problem constituting the subject of the complaint is remedied, the owner of the complaint shall be informed using his/her contact information. All of these works shall be recorded by HIS.

6.2 Operation Stage

In relation with the operation of the treatment facility that will be constructed within the scope of the PROJECT, there may be two different conditions. In case of operation of the treatment
facility by the Municipality personnel, the relevant personnel must be trained about the requirements in ÇYP for the operation stage of the PROJECT and in case the operation is given to a firm with a tender, ÇYP has to be provided to the bidder firms before bidding together with the tender documents, as is the case for the construction stage.

During the operation stage, both for the healthy operation of the facility and for regularly following up the environmental performance of the PROJECT, an operation team has to be formed by the MUNICIPALITY within the institutional structure. ÜÇER firm envisages the number of personnel for this work as 5. One of them shall be charged by the MUNICIPALITY for following up the environmental issues related with the operation stage.

During the operation stage of the PROJECT, in relation with the complaints and recommendations that may be received from the public in relation with the waste water discharge caused by the process in the PROJECT area or about the potable water provided to the public resident at the district center, the MUNICIPALITY shall establish a public relations mechanism to follow up the public relations process.

In case this operation activity is awarded to a private firm, these regulations shall be requested from the firm within the frame of a contract to be entered into by and between the firm and the MUNICIPALITY.

7 MEETING FOR INFORMING THE PUBLIC

Under the protocol signed with İller Bankası (İB), a “Meeting for informing the Public” (HBT) shall be held for the project developed by Polatlı Municipality (MUNICIPALITY), to which local public and local non governmental organizations (NGOs) and CONTRACTOR and the MUNICIPALITY will participate.

The purpose of this meeting is informing the relevant groups mentioned herein above about the possible environmental effects and effect mitigating precautions. At the meeting, the PROJECT shall be introduced by the MUNICIPALITY, and it shall be explained that it is targeted to provide a better service to the public at the district center by softening the existing potable water. The CONTRACTOR shall inform the relevant groups participating to the meeting in relation with the possible environmental effects of the PROJECT and the precautions to be taken against them.

HBT shall be held either in Yüzükbaşı village or Polatlı district center as the result of the interviews to be held between the MUNICIPALITY and the CONTRACTOR. Among the relevant groups, who will be called for the meeting, muhtar of Yüzükbaşı village, which is the closest residential unit to the PROJECT area, village residents and the irrigation associations who may be interested in the issue (Yukarı Sakarya Sulama birliği and Polatlı Hizmet Birliği) are considered. A final list relating to the relevant groups shall be determined by the CONTRACTOR prior to such HBT. Under the DB criteria, an HBT plan, indicating where, when and with the participation of whom will HBT be held (“Public Consultation and Disclosure Plan”) shall be prepared by the CONTRACTOR and submitted to the MUNICIPALITY. Before the meeting, the CONTRACTOR shall give an announcement to the local newspaper. For the purpose of introducing the PROJECT, the CONTRACTOR shall prepare public information documents for use at HBT (for example posters and hand brochures) and these documents shall be distributed to the participants at the meeting.

The results obtained in HBT shall be given to the MUNICIPALITY with a report to be prepared by the CONTRACTOR. The MUNICIPALITY shall submit this report to İB. In this report, the following information related with HBT shall be included:

- A minute including the date and place of the meeting,
- Short information related with the participants
- A copy of the presentations made at the meeting and
- Demands coming from the participants, which are accepted.

In addition to this meeting, a public relations mechanism to be operated by the CONTRACTOR in relation with the complaints that may come from the public during the construction stage is submitted in Chapter 6.1.3. In a similar way, a public relations process has to be followed by the MUNICIPALITY also during the operation stage.
R.T.
POLATLI MUNICIPALITY PRESIDENCY
WATER – BUS OPERATION DIRECTORATE

POLATLI (ANKARA) MUNICIPALITY
WATER TREATMENT
(SOFTENING) FACILITY CONSTRUCTION

EMP PUBLIC INFORMATION MEETING

ÜÇER MÜŞAVİR MÜHENDİSLİK A.Ş.
1. ENVIRONMENTAL EFFECTS OF CONSTRUCTION ACTIVITIES

1.1 EFFECTS ON WATER ENVIRONMENT
   1.1.1 Compliance with “good engineering” principles at the worksite:
   1.1.2 Taking sediment and erosion control precautions
   1.1.3 Waste water control
   1.1.4 Storage of Materials

1.2 AIR POLLUTER EMISSIONS
   1.2.1 Dust formation

1.3 SOLID WASTES

1.4 NOISE CONTROL

2. ENVIRONMENTAL EFFECTS DURING OPERATION STAGE

2.1 CONCENTRATED WASTE WATER

3. MONITORING PLAN

3.1 DURING THE CONSTRUCTION STAGE
   3.1.1 Water Quality and Waste Water Discharge
   3.1.2 Solid Wastes
   3.1.3 Air Quality
   3.1.4 Noise

3.2 DURING THE OPERATION STAGE
The possible environmental effects that may occur during the construction and operation activities of the project can be explained as follows:

1. ENVIRONMENTAL EFFECTS OF CONSTRUCTION ACTIVITIES

1.1 EFFECTS ON WATER ENVIRONMENT

The working methods to be used at the stage of construction must be determined so as to prevent the pollution of surface waters. The matters to be paid attention for this purpose can be explained as follows:

1.1.1 Compliance with “good engineering” principles at the worksite:
The discharge of construction materials, excavation wastes and similar wastes to the receiver water environment near the construction area shall not be permitted.

1.1.2 Taking sediment and erosion control precautions

In order to prevent soil losses that may occur as the result of sedimentation and erosion, with the purpose of preventing the reach of surface waters originating from the area to Yüzükbaşı Brook with the sediment load, the Contractor is obliged to construct a surrounding canal and to ensure that the waters collected in this canal are given to the receiver environment after being kept for a certain period.

1.1.3 Waste water control

For the removal of the wastewater to be produced by the personnel working at the worksite, either the existing system or an impermeable cesspit that will be constructed within the area shall be used. The waters collected in the cesspit shall be drawn with a scavenger and given to an appropriate place out of the worksite.

1.1.4 Storage of Materials

In case of spilling of the fuel or chemicals that may occur during the maintenance and repair of the work machinery, against the risk of pollution of Yüzükbaşı brook, the construction materials, machinery lubricants and petroleum products shall be stored in an area that is minimum 20 m to the brook shore.

1.2 AIR POLLUTER EMISSIONS

Minimization of the polluter emissions caused by the work machinery and transportation vehicles operating at the construction stage is the responsibility of the contractor. The precautions that can be taken about this issue can be listed as follows:
• Performance of inspection and maintenance within the frame of the regulations related with the vehicles
• Limitation of movements within the frame of possibilities
• Not operating the vehicles when the work is stopped.

1.2.1 Dust formation
The precautions that can be taken in order to prevent the dust created by construction activities are as follows:

• Keeping vehicles to be used for irrigation such as road washing machine at the worksite
• Application of 30 km/h speed limitation on the roads to be used for access to the worksite
• Cleaning the tires of the worksite vehicles before driving on the main road
• Covering the loaded excavation trucks.
• Appropriate irrigation during dust – creating operations
• Prevention of direct access of surface waters that will occur during struggle against dust to Yüzükbaşı Brook.

1.3 SOLID WASTES
The contractor shall be responsible for the separation of the solid wastes that will be produced during construction, at their source, for their collection and removal. The waste lubricants that may be produced during the maintenance and repair of the construction machines shall be kept in a provisional warehouse so as to comply with minimum conditions requested in the Regulation on the Control of Hazardous Wastes and thereafter they shall be removed by organizations authorized by the Ministry.

1.4 NOISE CONTROL
The precautions that will be taken in order to prevent the reach of noise pollution, which will occur as the result of the construction activities, to Yüzükbaşı Village, which is the nearest residential unit, are as follows:

• Performance of construction activities during daytime between 07:00 and 19:00
• Performing the site planning taking into account the sensitive receiver environment
• Not operating the work machinery at times during which work is not performed
• Ensuring the minimum use of warning sounds such as horns
• Equipping the vehicles with silencer appliance
• Ensuring that the noise limit values are between 70 – 100 dBA

2. ENVIRONMENTAL EFFECTS DURING OPERATION STAGE
The most important of the environmental effects that will occur during the operation stage of the project shall be the discharge of the concentrated waste water caused by the nano-filtration process. But as the result of the examinations performed, it has been determined that the wastewater to be given does not have any harmful effect on the receiver environment.
2.1 CONCENTRATED WASTE WATER

The surrounding of Yüzükbaşı Brook, where the discharge will be made in the project, is a brook from where the irrigation water need of the agricultural lands around is met; therefore the irrigation water class has been determined basing on the Sodium Absorption Ratio. With the mixture of the process water to the brook, the salinity and sodium values in the irrigation water has been found to be within reasonable limits.

In short, no problem has been determined in relation with giving the process wastewater to Yüzükbaşı Brook and using it as irrigation water in terms of salinity and electrical conductivity values.

The pre- and post discharge Sodium Absorption Values and Electrical Conductivity value of Yüzükbaşı Brook can be summarized as follows:

<table>
<thead>
<tr>
<th>Discharge condition</th>
<th>Sodium absorption ratio</th>
<th>Electrical conductivity value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before discharge</td>
<td>0.74</td>
<td>1.609 ( \mu )S/cm</td>
</tr>
<tr>
<td>After discharge</td>
<td>0.81</td>
<td>1.931 ( \mu )S/cm</td>
</tr>
</tbody>
</table>

As can be seen, when the values obtained are examined in terms of quality of irrigation water, it is seen that the same irrigation water class is valid for the brook before and after the discharge. (C₃S₁)

3. MONITORING PLAN

3.1 DURING THE CONSTRUCTION STAGE

3.1.1 Water Quality and Waste Water Discharge

The only receiver water environment that can be impacted potentially at the stage of construction is Yüzükbaşı Brook. For this reason, The Contractor shall have the analysis of parameters such as dissolved oxygen, turbidity, total suspended solid materials, oil – grease and coli form with the sample he will take before commencing construction, shall compare these results with the monitoring activities he will perform through “Independent Monitoring firms” and the results shall be regularly recorded.

3.1.2 Solid Wastes

The appropriate removal of the solid wastes that may occur at the worksite shall be monitored and reported by the Contractor.

3.1.3 Air Quality

The most important problem that may occur at the worksite in terms of air quality is dusting. For this purpose, Dust monitoring must be performed as follows:

- Regular assessment and control of dust production level during construction activities
- Performance of PM10 measurements within the site.

3.1.4 Noise

Noise monitoring work shall be performed between the commencement of construction and the activities, during which the noise level will increase, between 7:00 and 19:00, at a distance of 1.5 m to the house closest to the facility. All measurements shall be performed by
people having A–Class certificate employed by the Independent Monitoring Firm using calibrated sound level meters.

### 3.2 DURING THE OPERATION STAGE

The Monitoring Plan that will be applied at the stage of operation is summarized hereunder:

<table>
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<tr>
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<th>Description</th>
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<tr>
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</table>
Minutes of the Public Information Meeting Held For the Purpose of Application of Environmental Management Plan at 13 Eylül Culture Centre on May 25th 2006, Thursday at 15:00 for the Work of Polatlı (ANKARA) Municipality Water (Softening) Treatment Facility Construction

In relation with the meeting, announcements have been made in 3 local newspapers, billboards, bus stops, municipality entrances and exits, coffee houses in our district between the dates 22nd, 23rd, 24th 2006 and furthermore, SMS messages have been sent to the non governmental organizations, muhtars, irrigation associations, service associations, chamber presidents and assembly members and continuous announcements have been made so as to be heard at every point of our district.

Mayor Yakup ÇELİK, Civil and Environmental Engineer Demet GÜLKAL from Üçer Müş. Müh. A.Ş., the Water and Bus Operation Director of our Municipality Metin ÖZCAN and Tender and Purchasing Director Bahri YAZMAN have participated as speakers to the meeting held at 13 Eylül Culture Center of our Municipality on May 25th 2006 Thursday. Furthermore, 32 people have participated to the meeting.

During his presentation speech, Mayor Yakup ÇELİK has given information on the history of Polatlı Potable Water, necessity of treatment, determination of the system to be constructed, credit and financing search, the agreement process between the World Bank, İller Bankası and our Municipality, capacity of the facility and technical points of the facility and he has also provided information in relation with the environmental and health aspects of the work.

The participants have been asked if they wanted to obtain information in relation with the subject, and among the participants:

- Farmer Selahattin UZUN (from Yüzükbaşı Village) asked if treated water would be given to their village
- Mayor Yakup ÇELİK indicated that the necessary authority has been obtained from the Municipality Assembly and that water would be provided with a mutual protocol.
- Zafer KARACAR, muhtar of Cumhuriyet Quarter asked what the period of work was and whether the waste water that would be produced as the result of water treatment would give any damage to the environment and whether water interruptions would occur during the work.
- Mayor Yakup ÇELİK said that the period of work was 7 days, that there would be no water interruption during the construction. Civil and Environmental Engineer Demet GÜLKAL from Üçer Müş. Müh. A.Ş. indicated that the determinations made showed that the unused discharge water exiting from the treatment facilities had no damage on the environment as indicated in the technical information and ÇYP.
- Former Mayor of Polatlı and Polatlı Office President of Kızılay Association Lawyer Kazım BIYIKOĞLU asked what the hardness grade of the water would be after the completion of the treatment operation.
- Civil and Environmental Engineer Demet GÜLKAL from the Consultant Üçer Müş. Müh. A.Ş. indicated that the current hardness of the water was 50 – 55 French hardness and it would be lowered down to 17 French hardness, which is the most beneficial hardness degree for human health, as the result of the treatment.
- Mayor Yakup ÇELİK asked the participants again whether they had any other questions related with the subject, and the meeting is closed when no new questions are received. May 25th 2006.