Environmental Assessment Report

Odessa Oblast:
Teplodar town
Illichevsk town
Belgorod-Dnestrovskiy town

Volume 2

DRAFT

October 2005
Ukraine: Urban Infrastructure Project

ENVIRONMENTAL ASSESSMENT REPORT

Odessa Oblast: Teplovar town

Wastewater Collection/Treatment

Volume 2A

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INTRODUCTION

The town of Teplodar is located on the coast of Baraboysk water reservoir, 40 kilometers far from the regional center – the city of Odessa. The city was established in 1980-s, as a part of the nuclear power plant infrastructure. After the accident on Chernobyl nuclear power plant, the Soviet Union government has made a decision not to build a nuclear power plant near Odessa, but to resettle people, affected by Chernobyl disaster to Teplodar.

Despite there is a number of large enterprises in the city industrial zone, including those with foreign investments, such as joint ventures: Ukrainian-American “Interwindows”, Ukrainian-Swiss “Hillmak”; Joint Stock Company “Unal-ABC” (investments from Turkey), firms "Bera" and «Teplokrov», there is no city-forming enterprise, as all the above companies are actually registered in Odessa.

The first priority for the new town government, elected in 2002, is the rehabilitation of the town infrastructure with attraction of investments and development of small and medium businesses. With this purpose, management of municipal services was transferred to private companies. As a result, the quality of these services has improved, repairs of available housing were conducted.

There are numerous advantages in Teplodar, which can attract investors, such as:
- relatively low land tax, compared to Odessa;
- convenient geographic location (the town is located between the highways, connected to Izmail and the capital of Moldova – Kishinev.

In Teplodar, it is planned to introduce simplified system of registration of the enterprise “In one window”. On January 1st, 2004 the total population of the town was 9.1 thousand people. The part of the economically active population constitutes 67%.

Further sections of this report describe the proposed improvements and results of the EA. This draft has been reviewed; the review comments will be addressed in the final report.

Climate and Geography

Under climatic conditions, the investigated area belongs to the Black-Sea sub-area, with moderate-continental climate. The delta of Dniestro river has distinguishable climatic features. The territory belongs to the steppe zone. The land surface represents the low plain, which gradually goes down to the sea. It is crossed by the river valleys, which pass into drowned rivers and numerous beams.

Investigated area belongs to the Lower-Dniestro terrace region, which covers the Dniestro valley between Kuchurgansk and Dniestro drowned rivers. The bottomland and six terraces above it are very well developed here.

The range of heights on a platform is from 92.0 to 73.0 m above sea level. Beams represent well-developed erosive systems, cutting in the bottom parts of a loessial cover through all its thickness.
The major source of water supply for the town is the Dniestro river. The Baraboj river, located in 2 km to the east of the basic constructions, is drying up. A water basin is arranged on the river.

The main features of the climate are the soft temperature regime and high aridity; total radiation values and the number of hours of solar light are above the average. Continentality of a climate changes from 36-38% on the shore line up to 39% far from the sea.

In the winter, with moderately low temperatures, high relative humidity and the wind speed, a cooling effect is observed, resulting in “feels-like” -15- (-17)°C.

Because of frequent "thawing weather" periods, the snow cover is not stable. Duration of a frost-free period constitutes 166-208 days. Characteristic feature of a cold period is the extreme instability of a thermal regime.

Absolute temperature minimum is -28 (-30) °C. Absolute maximum is +36-40°C.

Annual sediment values increase with distance from the sea shore line; the annual average is 386 mm. Through the most of the year, the North quarter winds prevail (NW, N and NE); the average wind speed is 4-7 m/s.
II. REHABILITATION OF WASTEWATER COLLECTION AND TREATMENT SYSTEM

II.1. Existing Situation

II.1.1. Reconstruction of Wastewater Treatment Plant

II.1.1.1. General

Municipal sewage system in Teplodar comprises the following elements:

- residential buildings, equipped with water supply and sewage collection systems;
- intra-quarter and street gravity sewer collectors;
- sewage pumping station, located in the lower part of the city (WPS #1);
- pressure head sewer collector (two pipelines with 300 mm diameter and 8 km length) from WPS #1 to WPS #2;
- sewage pumping station (WPS #2), located in industrial zone territory;
- pressure head sewer collector (two pipelines with 500 mm diameter and 15 km length) from WPS #2 up to the reception chamber of the wastewater treatment plant;
- wastewater treatment plant - full biological treatment with additional treatment on filter installations # 1 and # 2;
- chlorination plant and the contact chamber;
- water pumping station and the reservoir of purified drains;
- pressure head waste pipeline with the dispersive outlet.

Schematic diagram of wastewater treatment plant (WwTP) is presented on the figure II.1.

Teplodar wastewater treatment plant is located on the left bank of the Dniestro river in Nadlimanskoe township and is designed for treatment of wastewaters from the towns of Teplodar, Beliaevki and the Mayaki township.
Waste water being released through the dispersive outlet into Dnestrovsky drowned river. There, wastewaters pass through "cane corridors", where biosanitation occurs (Figure II.2). Further, these waters merge with Dnistro river waters in its lower part and discharge into the Dnistro drowned river.

Design capacity of the WwTP is 17,000 m$^3$/day.

Actual wastewater inflow into intake chamber constitutes:
- Teplodar (municipal) - 3,200 m$^3$/day;
- Teplodar (industrial) - 600 m$^3$/day;
- Belyaevka - 300-600 m$^3$/day;
- Mayaki - 100 m$^3$/day
- Total - 4,500 m$^3$/day.

Maximum daily wastewater inflow into WwTP constitutes 26.5% from design capacity, minimal – just 10%. The water supply in the town of Teplodar is restricted by only 4 hours a day. WwTP works 24 hours a day, 365 days per year since 1989.

Since the time of commissioning, it was no major repair of WwTP.

The degree of equipment wear is 80%. Actual energy consumption by WwTP is much higher than the design parameters, which increases operation costs.

The present condition of WTP can be described as follows:

- Intake chamber and pressure head collectors have 70% degree of wear (Figure II.3).
- Because of corrosion, shutters have become unfit for use and need a replacement.
- Grit chamber (Figure II.4) – the roof is leaking in the building, ventilation is not working, replacement of metal parts is required, the doors need replacement either.
- Sand catchers – one sand catcher has 90% degree of wear and is not in working condition – a major repair is required.
- Storage block – as it was determined during investigation, 80% of technological pipelines, bolts and gates are out of operation; 90% of fences need replacement; there is no illumination; corrosion-resistant coating of metal surfaces is necessary.
- The sludge pumping station (Figure II.5) - ventilation is not in working condition, anticrosive protection of the equipment is absent. There is no illumination, drainage equipment does not work.
- Compressor station – ventilation is not in working condition, the roof is leaking, the equipment is not painted. The power capacity of compressor units is above the required level.

- Advanced purification unit # 1 - at present does not constitute a part of wastewater treatment cycle.
- Advanced purification unit # 2 - replacement of ventilation equipment and doors is required in the building. Repairing of a roof, equipment painting and replacement of protective fences are needed also.
- WPS - replacement of broken pumps and pumping equipment is needed. Automation equipment requires a major repair;
- Industrial-office building – repair of a roof, premises, ventilation systems, external illumination is required.
- Sand drying beds – replacement of delivery pipeline is required.
- Sludge drying beds - replacement of delivery pipelines (150 mm diameter), 900 meters total length is required.

II.1.2. Reconstruction of Sewage Pumping Stations

II.1.2.1. General

SPS # 1 as well as the whole wastewater treatment system of the town were originally designed for the treatment capacity of 12000 m³/day.

At present, at the SPS # 1 (commissioned in 1986), three SD 150/56b pumps with productivity of 150 m³/hour, pressure head of 56 m and 90 kW electric engine (Figure II.6) are installed.

Actual volume of treated wastewater is 3200 m³/day. During the periods of restricted water supply, the daily volume of wastewater inflow is only 1300 m³/day.

The pressure head sewer collector consists of two pipelines, 300 mm diameter and 8-kilometer length each (5 km – ceramic pipes and 3 km – steel pipes). This collector connects SPS #1 and SPS #2; it was put into operation in 1985. The degree of wear for these pipelines is 80%. The 40-meter segment of pressure sewer, located beneath the 12-meter-wide highway, requires replacement.
SPS #2, which was put into operation in 1989 and is located on industrial site territory, is designed to pump wastewater through the pressure sewer (diameter 500 mm, two pipelines) up to wastewater treatment station.

The design capacity of SPS #2 constitutes 17,000 m³/day. At present, SPS #2 is equipped with two pumps (FM 200/150-500, with 400 m³/h productivity, pressure head of 150 m, 200 kW electric engine and one SD 450/56b pump, with 370 m³/h productivity, pressure head of 58 m, and 90 kW electric engine. (Figure II.7).

At present, wastewater load on SPS #2 constitutes 3,800 m³/day.

It can be concluded from the above data, that the design capacities of SPS #1 and SPS #2 highly exceed the actual need.
II 2. Proposed Investment Projects

II.2.1. Reconstruction of Wastewater Treatment Plant

Through the period of wastewater treatment plant exploitation, it was no major equipment replacement, repair or reconstruction of the plant buildings and installations. Further operation of these installations without major repair may lead to total disruption of the town's wastewater system, which, in its part, will lead to serious environmental problems, contamination of the surface and ground waters.

Considering the above, the following potential solutions can be proposed:

- major repair of buildings and installations in order to prolong their lifetime and increase the level of safety of their functioning;
- replacement of the failed equipment across the sewage treatment plant, namely:
  - replacement of shutters in the reception chamber;
  - replacement of metal works in the grit chamber;
  - replacement of sand separators, restoration of a concrete covering and catwalk bridges;
  - replacement of 80 % of technological pipelines and reconstruction of storage blocks;
  - replacement of ventilation equipment on sludge pumping station, carrying out of anticorrosive protection of the equipment, reconstruction of the drainage equipment;
  - reconstruction of runoff afterpurification system;
  - replacement of delivery pipelines (150 mm diameter; 900 m length) on sludge drying beds;
  - repairs of industrial-office buildings;
  - major overhaul of a boiler-house for heating of industrial-office buildings (repair of a heating main, boilers, equipment, purchase of fuel).

Implementation of the above measures, aimed at wastewater treatment plant reconstruction, will allow to improve the environmental and sanitary-and-hygienic situation in the town, as well as to improve the quality of life of the population.

II.2.2. Reconstruction of Sewage Pumping Stations

Because it was no repair works at Teplodar wastewater pumping stations for more than 20 years, another major problem, apart from replacement of pumping equipment, is the reconstruction of buildings of wastewater pumping stations.

On SPS #1, the following measures are planned:

- major repair of the SPS building, in particular, its roof and floor ceilings;
- replacement of pumping equipment (SD 160/45 and KFS 250/63) for peak flows;
- replacement of ventilation equipment;
- construction of a buffer capacity for wastewater accumulation in order to avoid disruptions
- during the periods of intensive wastewater outflow from the town territory, which, in its part, will allow to prevent emergency discharges into the water body (Baraboj water basin);
replacement of the equipment in the reception chamber – comminuting screens.

Reconstruction measures, planned at SPS # 2:

- major overhaul of SPS building;
- replacement of pumping equipment for SD 160/45 and KFS 250/63 for the peak loads;
- ventilation system reconstruction;
- replacement of comminuting screens at the reception chamber;
- replacement of electric wiring.
II.3. Analysis of Potential Environmental Impacts

II.3.1. Reconstruction of Wastewater Treatment Plant

II.3.1.1. Physical Impacts

*Impacts on surface waters*

Designed biological treatment unit with afterpurification capability, as well as discharge of treated effluent through the dispersive outlet into Dniestrovsky drowned river with passage through "cane corridors", which creates biosanitation effect, provides for the acceptable (in accordance with environmental requirements) water quality at the control station. Biological wastewater treatment, in accordance with the project design, for the effluents with BOD values ranging from 375 mg/l to 210 mg/l and suspended solids concentrations ranging from 325 mg/l to 190 mg/l, allows to obtain a treated effluent with concentrations of the above parameters not exceeding 15 mg/l.

Results of chemical analyses at the reception chamber of the wastewater treatment plant are presented below, in the table 1, which demonstrates, that pollutant concentrations in the treated effluent are below the limit (maximum allowable value):

**Table 1. Results of chemical analyses at the WTP reception chamber**

<table>
<thead>
<tr>
<th>№</th>
<th>Measurements, mg/l</th>
<th>Reception chamber</th>
<th>Discharge (II sedimentation tanks)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>General</td>
<td>Teplodar</td>
</tr>
<tr>
<td>1</td>
<td>Suspended solids</td>
<td>125,7</td>
<td>120,0</td>
</tr>
<tr>
<td>2</td>
<td>BOD₅</td>
<td>126,1</td>
<td>107,5</td>
</tr>
<tr>
<td>3</td>
<td>Dense residuals</td>
<td>2435</td>
<td>1985</td>
</tr>
<tr>
<td>4</td>
<td>Ammonia nitrogen</td>
<td>29,9</td>
<td>34,6</td>
</tr>
<tr>
<td>5</td>
<td>Nitrites</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Nitrates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Chlorides</td>
<td>298,7</td>
<td>308,2</td>
</tr>
<tr>
<td>8</td>
<td>Sulphates</td>
<td>667</td>
<td>767,2</td>
</tr>
<tr>
<td>9</td>
<td>Copper</td>
<td>0,005</td>
<td>0,005</td>
</tr>
<tr>
<td>10</td>
<td>Iron</td>
<td>0,44</td>
<td>0,45</td>
</tr>
</tbody>
</table>

*Atmospheric impacts*

In the process of wastewater treatment plant work, a number of components, such as nitrogen dioxide, sulphur oxide, carbon oxide and ash are released into atmosphere. In addition, hydrogen sulphide, methane and ammonia are released. All emission values are within the allowable limits. Ground concentrations of pollutants do not exceed the maximum allowable value either.

*Influences on soil*

Water mains are designed in accordance with effective rules and standards, which include provisions for soil protection from pollution. After carrying out earthworks, technical and biological restoration will be undertaken.

*Influences on flora and fauna*

There is no influence on wildlife as the project is carried out on already urbanized territory. Planting of greenery around the sewage disposal plant site is performed.

*Wastes*
After carrying out reconstruction on the wastewater treatment plant in the town of Teplodar, waste composition does not change. Wastes, generated during the process of reconstruction and exploitation of the wastewater treatment plant, will be carried out to a landfill site.

II.3.1.2. Social impacts

As a result of the project implementation, improvement of the quality of service of the wastewater treatment plant is expected. Also, reconstruction will allow to reduce the risk of accident occurrence at WwTP.

II.3.2. Reconstruction of Sewage Pumping Stations

II.3.2.1. Physical Impacts

Local reconstruction of buildings and replacement of pumps and related equipment is planned at the wastewater pumping stations SPS # 1 and #2. During the process of reconstruction, no significant environmental impacts are expected. Reconstruction is to be conducted without expansion of SPS territory.

Air emissions containing such components as H2S, ammonia, methane, sulphur oxide, nitrogen oxide, carbon oxide are within the limits. After reconstruction, reduction of emission levels of the above components is expected. Direct release of untreated sewage into the nearby water body will no longer be possible.

Counter-emergency measures are incorporated into the project design. These measures provide protection of surface- and ground waters from untreated sewage release.

II.3.2.2. Social impacts

No involuntary human resettlement will not be conducted, because there will be no expansion of the territory during SPS reconstruction. Replacement of pumps and related equipment for new, more energy-efficient models, will allow to reduce the energy consumption by SPS, which, in turn, will allow to reduce the operation costs.
II.4. Review of Alternative Options

Analysis of alternative solutions was not conducted, as the necessity of the waste water system reconstruction is an acute problem for the town. So that, “do nothing” option cannot be considered.

II.5. Environmental Management Plan

II.5.1. Wastewater Treatment Plant Reconstruction

II.5.1.1. Brief Description of Key Environmental Issues

In the framework of the project on wastewater treatment plant reconstruction, which does not only serve the town of Teplodar, but also the towns of Beliaevka and Mayaki, the main environmental impact problem is the atmospheric contamination, as a result of construction works. It should be noted, that it will be no significant (above the established limits) impact on the environment, if construction rules and regulations are observed and designed preventive measures are undertaken.

Also, possible influence on surrounding vegetation will be mitigated with the help of biological restoration.

II.5.1.2. Mitigation Plan

Mitigation plan is presented in the Annex A1.

II.5.1.3. Monitoring Plan

Monitoring plan for the key parameters of the investment project on Teplodar wastewater system reconstruction is presented in the Annex B1.

II.5.2. Reconstruction of Sewage Pumping Stations

II.5.2.1. Brief Description of Key Environmental Issues

During wastewater pumping stations reconstruction, no significant environmental impact is expected. All project operations are conducted on existing or previously developed construction sites, inside the SPS buildings. Thus, it is no need to allocate new land sites or conduct compelled population resettlement. Contamination with wastewaters is prevented by the measures, designed in the project. Atmospheric impact is restricted and does not go beyond the maximum allowable levels.

II.5.2.2. Mitigation plan

Mitigation plan is presented in the Annex A.1.

II.5.2.3. Monitoring plan

Monitoring plan for the key parameters of the investment project on Teplodar wastewater treatment plant is presented in the Annex B.1.
III. INSTITUTIONAL ISSUES

The Environmental Management Plan will be implemented by the Borrower in order to ensure compliance with existing environmental and sanitary regulations in the process of construction and operation of proposed water supply, wastewater collection and solid waste management facilities in Odessa. Relevant executive authorities will be responsible for overall control and supervision of construction and operation of all proposed facilities. The day-to-day supervision of environmental performance will be part of the design/construction supervision process. There is no plan for the involvement of non-governmental organizations in the independent monitoring of the project.

In order to improve the quality of pipeline replacement works and prevent accidents, replacement of aging equipment is planned. In particular, purchase of digging equipment, special equipment, trucks and load-lifting mechanisms is planned.

IV. PUBLIC CONSULTATIONS

In accordance with the World Bank requirement, the public consultation process was organized as part of the environmental assessment, in order to discuss the proposed urban infrastructure development projects with various stakeholder groups in Odessa, Teplodar, Illichevsk and Belgorod-Dnestrovskiy. This public consultation involved two stages.

The first public consultation was held on 16 August 2005 to discuss the EA Terms of Reference, EA report structure and preparation schedule. Relevant project information was distributed among the participants present at the meeting.

The second public consultation was held on 9 September 2005 to discuss the results of environmental assessment for all proposed investment projects.

The main objectives of public consultation process are to:
• Ensure transparency of environmental assessment;
• Provide project information to key stakeholder groups;
• Provide a forum for discussion of social/public concerns;
• Receive feedback from key stakeholder groups in order to gain better understanding of their perceptions and expectations.

The following stakeholders should be involved in the public consultation process:
• Project sponsor;
• Local scientific community;
• Representatives of EA/EIA team, experts;
• Statutory and political authorities;
• Local self-governance bodies;
• Trade unions, public groups and political parties;
• Local confessions and religious groups;
• Local communities;
• Other stakeholder groups.

The public consultation on the proposed project provided valuable feedback from various stakeholder, which was taken into account in the present Environmental Assessment report.
V. CONCLUSIONS

After careful analysis of current situation and proposed wastewater system rehabilitation including:

- reconstruction of wastewater treatment plant;
- reconstruction of wastewater pumping stations

it can be concluded that the proposed projects would provide improvements in human hygiene and environmental situation, and can be promoted to the next stage of project preparation cycle.
ANNEX A – Mitigation Plan
## Annex A.1. Mitigation Plan: Rehabilitation of Municipal Sewer Network

<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Mitigating Measure</th>
<th>Cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
</table>
| Construction           | Potential impact of construction activity on the pedestrian safety in the location of construction site | • Provision of safety fence around the construction site.  
• Restricted access to the construction site on the basis of passes | Allowance made in the project budget                                              | Contractor                  |
|                        | Dust emissions during construction                                     | • Implement dust avoidance measures.  
• Covering of earth/building material transporting vehicles.  
• Watering of access roads and excavation zones, implementation of good construction practice, site cleaning at the end of working hours.  
• Use of protective covers and screens to contain fugitive dust emissions wherever possible. | Allowance made in the project budget                                              | Contractor                  |
| Noise and vibration    |                                                                      | • Restricting noisy construction activities to normal daily working hours.  
• Adopting a reasonable work schedule.  
• Use of acoustical enclosures or noise suppressors for noisy equipment where appropriate | Allowance made in the project budget                                              | Contractor                  |
| Short-term surface water and soil contamination from leaks or spills of process chemicals such as fuel oils/lubricants, paints, cooling agents etc. | • Regular inspection and proper maintenance of vehicles and equipment.  
• Provision of adequate containment for fuel oils and lubricants, paints, cooling agents, solvents etc.  
• Prompt elimination and control of leaks and spills.  
• Identification of a minimum required number of delivery routes for fuel and lubricants, cooling agents, paints, solvents and asphalt material to minimize risk of accidental spills and releases.  
• Limiting vehicle maintenance operations to specially designated sites. | Allowance made in the project budget                                              | Contractor                  |
| Short-term groundwater and soil contamination from spills during the connection of new piping to the existing sewer network | • Strict compliance with construction standards and design specifications | Allowance made in the project budget                                              | Contractor                  |
| Air emissions during equipment operation | • Ensure proper technical state of all equipment.  
• Restricting construction activities to reasonable working hours. | Allowance made in the project budget                                              | Contractor                  |
| Top soil stripping may affect soil properties | • Provide adequate temporary storage for top soil material and subsequent restoration of disturbed site | Allowance made in the project budget                                              | Contractor                  |
| Interference with natural drainage | • Short-term impact. No special mitigation measures are required | Allowance made in the project budget                                              | Contractor                  |
| Damage to trees and other vegetation during construction | • Minimise the potential for damage.  
• Replant/restore affected vegetation cover | Allowance made in the project budget                                              | Contractor                  |
<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Mitigating Measure</th>
<th>Cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction waste and old piping can be a potentially significant effect unless properly managed</td>
<td>• All waste materials, generated during construction, including hazardous waste, should be delivered to the official sanitary landfill(s).</td>
<td>Allowance made in the project budget</td>
<td>Contractor</td>
<td></td>
</tr>
</tbody>
</table>
| Operation | Odours and noise generated by sewage pumping station can cause considerable nuisance to local residents | • Air emissions from sewer mains should be minimised.  
• Pumping stations should be appropriately located at a sufficient distance from residential areas, in adequately insulated buildings. | Operating cost               | Operator                     |
| Soil and groundwater contamination due to leaks from sewer system | • Adequate leak control.  
• Comprehensive quality assurance/control programme during construction, with subsequent technical inspection and maintenance programme | Operating cost               | Operator                     |
ANNEX B Monitoring Plan
### Annex B.1. Monitoring Plan: Rehabilitation of Municipal Sewer Network

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Monitoring Parameter</th>
<th>Monitoring Location</th>
<th>Monitoring Technique</th>
<th>Monitoring Frequency</th>
<th>Performance Target</th>
<th>Institutional Responsibility</th>
<th>Target Audience</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target Performance Indicators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Construction and Operation</strong></td>
<td>% of losses in sewer network</td>
<td>Centralized sewer system</td>
<td>Instrumented measurements</td>
<td>Daily during construction, monthly during operation</td>
<td>0%</td>
<td>Contractor, local environmental and water management authorities, sanitary service</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td><strong>Intermediate Performance Indicators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td>Groundwater contamination</td>
<td>Storm drains in the locations of sewer collection mains</td>
<td>Instrumented measurements</td>
<td>Daily during construction</td>
<td>Background (baseline) pollutant concentrations in groundwater</td>
<td>Contractor, local environmental and water management authorities, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td></td>
<td>Soil contamination along the sewer collector lines</td>
<td>Monitoring boreholes drilled in the selected locations</td>
<td>Instrumented measurements</td>
<td>Monthly during construction</td>
<td>Background (baseline) levels</td>
<td>Contractor, local environmental authorities, sanitary service, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td></td>
<td>Air emissions</td>
<td>Construction site and surroundings</td>
<td>Acoustic measurements, public/personnel complaints</td>
<td>Daily or as deemed necessary during construction</td>
<td>Approved emission limit values</td>
<td>Contractor, local environmental authorities, sanitary service, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td></td>
<td>Noise and vibration</td>
<td>Construction site and surroundings</td>
<td>Visual inspection, public/personnel complaints</td>
<td>Daily or as deemed necessary during construction</td>
<td>Approved impact limit values</td>
<td>Contractor, sanitary service, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td></td>
<td>Waste generation and management</td>
<td>Construction site and surroundings</td>
<td>Continuous daily control</td>
<td>Approved waste generation/disposal limits</td>
<td>Contractor, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
<td></td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td>Groundwater contamination</td>
<td>Storm drains in the locations of sewer collection mains</td>
<td>Instrumented measurements</td>
<td>Weekly during operation</td>
<td>Background (baseline) levels</td>
<td>Contractor, local environmental authorities, sanitary service</td>
<td>Sanitary service, local environmental authorities, public</td>
</tr>
<tr>
<td></td>
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<td>Monitoring boreholes drilled in the selected locations</td>
<td>Instrumented measurements</td>
<td>Monthly during operation</td>
<td>Background (baseline) levels</td>
<td>Contractor, local environmental authorities, sanitary service</td>
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<td>Along the sewer main route</td>
<td>Instrumented measurements</td>
<td>Daily or as deemed necessary during operation</td>
<td>Approved emission limit values</td>
<td>Contractor, local environmental authorities, sanitary service</td>
<td>Sanitary service, local environmental authorities, public</td>
</tr>
<tr>
<td></td>
<td>Waste generation and management</td>
<td>Along the sewer main route</td>
<td>Visual inspection, waste inventory, evidence from landfill operator</td>
<td>Monthly</td>
<td>Approved waste generation/disposal limits</td>
<td>Contractor, local environmental authorities, sanitary service</td>
<td>Sanitary service, local environmental authorities, public</td>
</tr>
</tbody>
</table>
Ukraine: Urban Infrastructure Project

ENVIRONMENTAL ASSESSMENT REPORT

Odessa Oblast: Illichevsk town

Wastewater Collection

Volume 2B

October 2005

DRAFT
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INTRODUCTION

Illichevsk is a town in Odessa Oblast. It is an industrial centre. The main industries are machine-building, and those related to fishery, ship repair and shipbuilding. Illichevsk is a big marine trade port of Ukraine, fishery port and a base of fish-industry fleet “Antartika”. Illichevsk actively participates in international division of labour: foreign-trade export-import operations are the most part of freight flows, there is an up-to-date Illichevsk-Varna ferry-crossing that is a bridge between Ukraine and Bulgaria. As a satellite town of Odessa city, Illichevsk accomplishes a set of important economic functions.

As a big port-and-industrial centre, Illichevsk is closely related to Nikolaev and Kherson Oblasts.

Illichevsk town, Aleksandrovka settlement, Malodolinskoe and Burlachia Balka villages are under the jurisdiction of Illichevsk town council.

Total town area is 2,542 hectares.

Total population of Illichevsk is 57,000 people, total population of Illichevsk and above mentioned settlement and villages is above 65,000 people.

Illichevsk is a very green town, it has many parks and public gardens.

The town has up-to-date municipal infrastructure. Centralised water supply and heating systems cover the biggest part of territory around town council, port and industrial enterprises.

A repair of main sewage pumping station has allowed to stop discharge of non-treated wastewater into the sea; thus the ecological situation of recreation zone was improved.
Climate

Climate is temperate-continental with short mild winter and long warm summer. Mean annual ambient air temperature is $10.3^\circ$C.

North-western winds are predominant.

According to the Construction Standard SNiP 2.01.01-82 the following was assumed as a basis:
- climate region – III;
- climate sub-region – III$^6$;
- mean monthly temperature in January – $-2.5^\circ$C;
- mean monthly temperature in July – $22.2^\circ$C;
- mean monthly ambient air temperature for design of heat supply and ventilation systems – $18^\circ$C;
- duration of heating season – 165 days;
- annual relative humidity of ambient air in July – 55%;
- mean annual precipitation range - 456 mm;
- estimated wind pressure for the region III – 0.30 kPa;
- estimated snow cover on 1 m$^2$ of horizontal land for region I – 0.50 kPa;
- frost penetration zone – 0.8 m;
- estimated seismicity according to SNiP P-7-81 – 6.

Geology and Topography

The Neogenic and Quaternary deposits are important elements of site geology and comprise loams and limestone.

Groundwater is present at depths of between 6.0 and 6.2 m and is associated with limestone. Groundwater raising amplitude is 1.0 m. Groundwater is highly-aggressive due to chlorides content under periodical wetting and low-aggressive due to carbonic acid content for concrete based on Portland cement with normal penetration. Neogenic loams possess swelling features.

Further sections of this report describe the proposed improvements and results of the EA. This draft has been reviewed; the review comments will be addressed in the final report.
II. REHABILITATION OF WASTEWATER COLLECTION SYSTEM

II.1. Existing Situation

II.1.1. General

Illichevsk has separate sewer system covering low- and high-rise buildings. Total sewage flow is 20,000 m³/day.

The location of main sewage pumping station (MSPS) is given on Figure II.1. SPS is marked by red circle.

Figure II.1. Location of Main Sewage Pumping Station (marked by red circle)
The station is situated in rotunda (diameter - 16 m).

Wastewater flows in gravity pipelines $D=700$ mm to MSPS (Figure II.2), whereupon in high-pressure pipelines $D=1,000$ mm to treatment units, located in Sanzheika village (total capacity - 25,000 m$^3$/day).

Rehabilitation works on MSPS stopped in 1997. At present it is in very poor state and needs to be completely restored.

Pipelines are located on the depth of 5.5 m.

Wastewater flows into 2 pipelines (section 980x1500 mm) from the receiving well. Pipelines have gate valves (Figure II.3). There are manual grates for detention of big-size wastes.

Data of chemical analysis of wastewater entering MSPS are given in Table II.1.

Table II.1. - Data of chemical analyses of raw effluent entering main sewage pumping station

<table>
<thead>
<tr>
<th>NN</th>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pH</td>
<td></td>
<td>6.74</td>
</tr>
<tr>
<td>2</td>
<td>Carbonates (CO$_3$)</td>
<td>mg/l</td>
<td>0.00</td>
</tr>
<tr>
<td>3</td>
<td>Hydrocarbonates (H CO$_3$)</td>
<td>mg/l</td>
<td>439.20</td>
</tr>
<tr>
<td>4</td>
<td>Chlorides(Cl)</td>
<td>mg/l</td>
<td>115.21</td>
</tr>
<tr>
<td>5</td>
<td>Sulphates (SO$_4$)</td>
<td>mg/l</td>
<td>85.92</td>
</tr>
<tr>
<td>6</td>
<td>Suspended solids</td>
<td>mg/l</td>
<td>96.00</td>
</tr>
<tr>
<td>7</td>
<td>Ammonia nitrogen (NH$_4$)</td>
<td>mg/l</td>
<td>38.76</td>
</tr>
<tr>
<td>8</td>
<td>Nitrites (NO$_2$)</td>
<td>mg/l</td>
<td>0.00</td>
</tr>
<tr>
<td>9</td>
<td>Nitrates (NO$_3$)</td>
<td>mg/l</td>
<td>0.50</td>
</tr>
<tr>
<td>10</td>
<td>Oil products</td>
<td>mg/l</td>
<td>0.37</td>
</tr>
<tr>
<td>11</td>
<td>BOD$_5$</td>
<td>mg/l</td>
<td>227.75</td>
</tr>
<tr>
<td>12</td>
<td>BOD$_{total}$</td>
<td>mg/l</td>
<td>302.91</td>
</tr>
<tr>
<td>13</td>
<td>Fats</td>
<td>mg/l</td>
<td>12.90</td>
</tr>
<tr>
<td>14</td>
<td>Surfactants</td>
<td>mg/l</td>
<td>2.00</td>
</tr>
<tr>
<td>15</td>
<td>Estimated dry residue</td>
<td>mg/l</td>
<td>662.20</td>
</tr>
<tr>
<td>16</td>
<td>Total water hardness</td>
<td>mg eqv/l</td>
<td>5.50</td>
</tr>
<tr>
<td>17</td>
<td>Total mineralization</td>
<td>mg/l</td>
<td>881.80</td>
</tr>
</tbody>
</table>
Chemical analyses are performed in the port laboratory.

Crusher D3b is used to crush debris. Crushed waste materials go to the receiving tank. Solid waste materials removed from bar screens are disposed of at the municipal landfill site.

Pumps are working in automated mode.

High-pressure pipelines have check valves and electric regulating valves.

All pumping equipment has reached the end of its operational life. Thus capital repair has to be done once per 3 months. Lack of mechanized grates on canals is the problem as manual grates detent only big-size wastes and wastes enter treatment units. Such wastes decrease level of water clarification in primary precipitation (actual level – 35-40 %, standard level – 50%) tanks and decrease biological treatment of wastewater.

Due to frequent pump breakages there is a threat of sewage overflow at the pumping station site and release of untreated wastewater into the Black Sea. Ammonia nitrogen concentration in wastewater is 40-65 mg/l. Section of high-pressure pipeline is not enough for the planned increase of wastewater volumes in the result of the town growth. Equipment and construction units of the pumping station needs to be repaired.

The lack of hydraulic impact alleviator on high-pressure pipelines may cause pipeline breakage in case of electricity power cut off.

Design documentation on rehabilitation has been developed for the Utility budget.

1.1.2. Site Geology

The site is located within the town area. It slopes down towards the sea. Altitude marks are in range of 10.5-8.8 m. Geomorphologically, the site is on the right slope of Bugovska gully near the Black Sea coast.

Gravity pipeline is located above the brown loess-like loam. Type of soil subsidence – I.

Underground water is present at depth 4.7 m. Amplitude of fluctuation is 1.0 m.

Geological section of site is given on Figure II.4.
Figure II.4. Geological Section of the Site
II.2. Proposed Investment Projects

The proposed investment projects include the following:

- Replacement of key technological and electrical equipment in grate section and machine section;
- Installation of check valves and cancellers in metering section;
- Installation of electric drives on regulating valves in the switching/regulating section;
- Construction of storm water pipelines for water withdrawal from the station site;
- Purchase of one special vehicle for scouring of sewage pipelines.

Main Sewer Pumping Station

The project includes the following:

- Grate section:
  - Replacement of gate valves on pipelines;
  - Installation of grates RGR2000 NIKTI GKh;
  - Installation of crusher D3b;
  - Installation of handling machinery;
- Machine section:
  - Replacement of 5 pumps SD450/56a instead of 3 old pumps DF540-90;
  - Installation of pumps VK 5/32 for technical water;
  - Installation of drainage pump "Gnom 25-20 T";
  - Installation of electric sectional regulating valves on block terminal.

Project also includes:

- Construction of tank for break of water sheet;
- Provision of 12-fold air change in grate section and rehabilitation of ventilation system.

Rehabilitation of existing sewage pumping station will contribute into improvement of ecological situation in the region.

According to Construction Standard SNiP 2.04.03-85 the station is classified on reliability level as type 1. It should work constantly on fixed level.

Storm water pipelines will consist of 2 new pipelines and 1 existing pipeline:

- Pipeline to storm water tank N1 – will be constructed;
- Pipeline to storm water tank N2 - will be constructed;
- Existing pipeline D=1,000 mm to storm water tank N3.

Existing storm water tank N3 needs to be rehabilitated.

Selection of Key and Auxiliary Equipment

Key electric pumping equipment was selected due to demands and calculated rates. It is proposed to install 3 operational pumps (SD450/56a) and 2 standby.

In machine section it is proposed to install pumps for technical water VK5/321 (1 operational pump and 1 standby).

It is proposed to install 2 grates and 1 crusher.
Disassembling and installation of equipment will be performed by handling machinery according to demands of existing normative and legislation documents.

**Storm Water Pipeline**

Storm water pipelines will be constructed to manage rainstorm runoff, which causes regular elevations of groundwater levels at the site. Monolithic concrete and reinforced concrete drop wells DK-1 and DK-2 are foreseen.

**Switching/Regulating Section and Metering Section**

There are no electric drives in existing switching/regulating section. Installation of electric drives is foreseen in the framework of project performance.

Check valves and cancellers will be installed in metering section in order to prevent hydraulic hammers.

**Heating and Ventilation**

Rehabilitation of heating system is not foreseen.

Combined extract and input ventilation is foreseen. Air removal will be performed from 2 zones (1/3 from upper zone and 2/3 from lower zone). Ventilation unit on crusher is foreseen.

Remote control of ventilation units and alarm (for case of emergency electricity cut off) are planned in design documentation.

**Electric-Technical Solutions**

Replacement of all electrical equipment (Figure II.5) is necessary as equipment has reached the end of its operational life.

It is planned to install 5 new pumps type SD450+56a (3 operational pumps and 2 standby) and some auxiliary equipment.

All design documents were developed according to demands of existing standards.

Engines of pumps are key energy-consumers, according to Construction Standard they are classified on reliability level as types I and II.

Calculated maximal electricity demands are given in Table II.2.
Table II.2. - Calculated Maximum Electricity Demand

<table>
<thead>
<tr>
<th>NN</th>
<th>Consumer</th>
<th>Demand</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Active energy, kW</td>
<td>Reactive energy, quark</td>
</tr>
<tr>
<td>1</td>
<td>Sewage pumping station</td>
<td>350.30</td>
<td>168.1</td>
</tr>
<tr>
<td>2</td>
<td>Other consumers on site</td>
<td>33.0</td>
<td>23.0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>383.3</td>
<td>191.6</td>
</tr>
</tbody>
</table>

Electricity supply will be provided through two cable lines (0.4 kV) from separate transformer station 10/0.4 kV (Figure 11.6).

Electrical equipment TP-10/04 will be installed in separate building. Installation of two additional transformers is foreseen. Selection of transformers was performed according to existing standard GOST 11677.

Complete compensation of reactive energy is foreseen due to installation of capacitor units type UKRP-0,4-200-20UZ (Figure II.7) with automatic control.

Metering of active and reactive energy consumption is foreseen.

Control and Alarm Systems

All electrical equipment (pumps, grates, etc.) will work in automatic mode. In case of emergency operational pump cut off, standby pump will operate automatically.

Operational and emergency alarm systems are foreseen.

Control of key technological parameters (pressure, leakages, temperature, etc.) is foreseen.
II.3. Analysis of Potential Environmental Impacts

Using the criteria set out in the World Bank's Operational Policy on Environmental Assessment, the proposed project is classified into category A.

II.3.1. Physical Impact

Physical effects on the environment may arise on a stage of reconstruction of sewage pumping station, in particular from construction of storm water pipelines. It should be noted that earthworks constitute an essential part of the proposed construction project.

All mitigation actions and environmental protection activities are included in the design documentation. They were developed according to acting normative and legislation documents and are directed to elimination of negative impact on water, soil and vegetation layer.

The potential environmental impacts that may arise during different stages of the project are considered below in relation to the proposed project development:

- **Impact on local geology**: is unlikely as the project does not include operations that may affect the geological environment;
- **Impact on local climate**: is unlikely;
- **Impact on fauna**: is unlikely as all works will be performed within urban area;
- **Impact on ambient air quality**: is likely to be at or below existing guideline levels, being limited to emissions from mobile sources. Corresponding measures are foreseen;
- **Impact on water bodies**: during rehabilitation works the station should be stopped. All works should be performed after holiday season. Wastewater will be discharged into the sea. Corresponding agreement/permission with local authorities responsible for environmental protection should be received;
- **Impact on soil**: The construction would involve top soil stripping with subsequent restoration. New pipes will be watertight. Construction waste will be managed in accordance with existing regulations;
- **Damage to trees and vegetation cover**: is considered to be acceptable, and will be mitigated through on-site tree planting;
- **Impact to existing utilities/infrastructure**: The proposed rehabilitation project will contribute to the improvement of town's service infrastructure and ecological situation.

II.3.2. Social Impacts

Performance of the proposed project will improve quality of serviced provide to population and enterprises in Illichevsk tow.

After rehabilitation there will be no "flooding" of site area, no collapse of equipment and no emergency wastewater discharge into the Black Sea.

As Illichevsk is a resort town ecological situation in the region is very important. All above mentioned will contribute into improvement of ecological situation in the region and quality of marine water.

1. OP 4.01 Environmental Assessment
The project foresees modernization and replacement of all electrical equipment. Thus, the project will have great energy-saving effect.

The proposed project will neither produce any significant social impact, nor pose a threat to human health and living conditions.

The results of the environmental assessment indicate that the project implementation will not cause any adverse impact to local industries, agricultural activities, residential areas, surface and subsurface infrastructure, recreational areas and cultural assets.

No archaeoalogical or cultural resources are expected to be encountered during the project implementation.

The project will not entail involuntary resettlement activity.
II.4. Review of Alternative Options

No alternative options have been considered for the proposed rehabilitation projects. Rehabilitation of sewage pump station and purchase of special vehicles appears to be the only viable option in view of prevention of emergency situation and improvement of ecological situation in region.

The analysis of “status quo” scenario shows that the existing situation is not sustainable and needs to be improved.

II.5. Environmental Management Plan

II.5.1. Brief Description of Key Environmental Issues

The project is aimed at improvement, modernization of existing wastewater collection.

During the project implementation key negative impacts are as follows:
- Discharge of non-treated wastewater into the Black Sea while replacing equipment;
- Earthworks while constructing storm water pipelines.

All components of the project are aimed at improvement of ecological situation in the region. All potential environmental impacts will be mitigated due to application of corresponding construction methods and compliance with existing environmental normative and legislation demands.

In order to protect marine coastal zone from pollution the following activities are foreseen:
- Replacement of new pumping equipment – will allow to eliminate non-treated wastewater discharge into the Black Sea;
- Two storm water pipelines construction.

II.5.2. Mitigation Plan

The list of proposed mitigation measures is presented in Annex A.1.

II.5.3. Monitoring Plan

Key environmental objective of the proposed investment project is to eliminate discharge of non-treated wastewater into the Black Sea, minimize the potential for soil and groundwater contamination through improved control and elimination of leaks from sewer network.

The key performance indicator to measure the success in achieving this objective is the percentage reduction in leakage from the rehabilitated sewer mains.

Intermediate performance indicators relate to key potential environmental impacts (on soil, groundwater and vegetation cover), identified in the environmental assessment, which need to be monitored in order to ensure compliance with existing environmental and health legislation of Ukraine.

Other environmental performance indicators relate to the impact of noise and vibration, waste generation and management during construction. Proposed monitoring plan is presented in Annex B.1.
III. INSTITUTIONAL ISSUES

The Borrower has adequate capacity and resources required to ensure compliance with existing environmental standards and regulations during the implementation of proposed investment projects, with the assistance and supervision of all relevant authorities responsible for environment protection, sanitary and occupational safety.

There is no plan for the involvement of the public in monitoring activity for this project.

IV. PUBLIC CONSULTATION

In accordance with the World Bank requirement, the public consultation process was organized as part of the environmental assessment, in order to discuss the proposed urban infrastructure development projects. This public consultation involved two stages.

The first public consultation was held on 16 August 2005 to discuss the EA Terms of Reference, EA report structure and preparation schedule. Relevant project information was distributed among the participants present at the meeting.

The second public consultation was held on 9 September 2005 to discuss the results of environmental assessment for proposed investment projects. Minutes are attached.

The following key stakeholder groups were involved in the consultation process: statutory/political authorities, NGOs and public group representatives.

Generally, the consultation process was extremely productive and useful, and valuable comments were provided with regard to the project implementation. The public representatives expressed support for the project.

All comments and recommendations have been taken into account in preparation of the present report.
V. CONCLUSIONS

The objective of this Environmental Assessment was to identify and assess the potential environmental impacts associated with the proposed urban infrastructure improvements in Illichevsk, including:

Rehabilitation of wastewater collection system:
- Replacement of key technological and electrical equipment in grate section and machine section;
- Installation of check valves and cancellers in metering section;
- Installation of electric drives on regulating valves in the switching/regulating section;
- Construction of storm water pipelines for water withdrawal from the station site;
- Purchase of one special vehicle for scouring of sewage pipelines.

Based on the results of the Environmental Assessment, it can be concluded that the proposed projects would improve the sanitary and environmental situation in the region, and can be promoted to the next stage of project preparation cycle.
ANNEX A – Mitigation Plan
Annex A.1. Mitigation Plan: Rehabilitation of Wastewater Collection System

<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Mitigation measure</th>
<th>Cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
</table>
| Construction           | Potential impact of construction activity on the pedestrian safety in the location of construction site | - Provision of safety fence around the construction site.  
- Restricted access to the construction site on the basis of passes | Allowance made in the project budget | Contractor                   |
| Dust emissions during construction | - Implement dust avoidance measures.  
- Covering of earth/building material transporting vehicles.  
- Watering of access roads and excavation zones, implementation of good construction practice, site cleaning at the end of working hours.  
- Use of protective covers and screens to contain fugitive dust emissions wherever possible. | Allowance made in the project budget | Contractor                   |
| Noise and vibration    | - Restricting noisy construction activities to normal daily working hours.  
- Adopting a reasonable work schedule.  
- Use of acoustical enclosures or noise suppressors for noisy equipment where appropriate. | Allowance made in the project budget | Contractor                   |
| Short-term surface water and soil contamination from leaks or spills of process chemicals such as fuel oils/lubricants, paints, cooling agents etc. | - Regular inspection and proper maintenance of vehicles and equipment.  
- Provision of adequate containment for fuel oils and lubricants, paints, cooling agents, solvents etc.  
- Prompt elimination and control of leaks and spills.  
- Identification of a minimum required number of delivery routes for fuel and lubricants, cooling agents, paints, solvents and asphalt material to minimize risk of accidental spills and releases.  
- Limiting vehicle maintenance operations to specially designated sites. | Allowance made in the project budget | Contractor                   |
| Short-term groundwater and soil contamination from spills during the connection of new piping to the existing sewer network | - Strict compliance with construction standards and design specifications | Allowance made in the project budget | Contractor                   |
| Air emissions during equipment operation | - Ensure proper technical state of all equipment.  
- Restricting construction activities to reasonable working hours. | Allowance made in the project budget | Contractor                   |
| Top soil stripping may affect soil properties | - Provide adequate temporary storage for top soil material and subsequent restoration of disturbed site | Allowance made in the project budget | Contractor                   |
| Interference with natural drainage | - Short-term impact. No special mitigation measures are required | Allowance made in the project budget | Contractor                   |
| Damage to trees and other vegetation during construction | - Minimise the potential for damage.  
- Replant/restor affected vegetation cover. | Allowance made in the project budget | Contractor                   |
<p>| Construction waste and old piping can be a potentially significant effect unless properly managed | - All waste materials, generated during construction, including hazardous waste, should be delivered to the official sanitary landfill(s). | Allowance made in the project budget | Contractor                   |</p>
<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Mitigation measure</th>
<th>Cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
</table>
| Operation | Odours and noise generated by sewage pumping station can cause considerable nuisance to local residents | • Air emissions from sewer mains should be minimised.  
• Pumping stations should be appropriately located at a sufficient distance from residential areas, in adequately insulated buildings. | Operating cost | Operator                    |
| Soil and groundwater contamination due to leaks from sewer system | • Adequate leak control.  
• Comprehensive quality assurance/control programme during construction, with subsequent technical inspection and maintenance programme | Operating cost | Operator                    |
ANNEX B – Monitoring Plan
### Annex B.1. Monitoring Plan: Rehabilitation of Wastewater Collection System

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Parameter</th>
<th>Monitoring Location</th>
<th>Monitoring Technique</th>
<th>Monitoring Frequency</th>
<th>Performance Target</th>
<th>Institutional Responsibility</th>
<th>Target Audience</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction and Supervision</strong></td>
<td>Contaminant loadings in treated effluent</td>
<td>Discharge outfall</td>
<td>Instrumented measurements (physical, chemical, bacteriological, radiological parameters)</td>
<td>Daily</td>
<td>Approved discharge limit values</td>
<td>Contractor, local environmental and water management authorities, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td></td>
<td>% of losses in sewer network</td>
<td>Centralized sewer system</td>
<td>Instrumented measurements</td>
<td>Daily during construction, monthly during operation</td>
<td>0%</td>
<td>Contractor, local environmental and water management authorities, sanitary service</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td></td>
<td>Groundwater contamination</td>
<td>Storm drains in the locations of sewer collection mains</td>
<td>Instrumented measurements</td>
<td>Daily during construction</td>
<td>Background (baseline) pollutant concentrations in groundwater</td>
<td>Contractor, local environmental and water management authorities, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td></td>
<td>Soil contamination along the sewer collector lines</td>
<td>Monitoring boreholes drilled in the selected locations</td>
<td>Instrumented measurements</td>
<td>Monthly during construction</td>
<td>Background (baseline) levels</td>
<td>Contractor, local environmental authorities, sanitary service, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
</tbody>
</table>

**Intermediate Performance Indicators**

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Parameter</th>
<th>Monitoring Location</th>
<th>Monitoring Technique</th>
<th>Monitoring Frequency</th>
<th>Performance Target</th>
<th>Institutional Responsibility</th>
<th>Target Audience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Air emissions</td>
<td>Construction site and surroundings</td>
<td>Instrumented measurements</td>
<td>Daily or as deemed necessary during construction</td>
<td>Approved emission limit values</td>
<td>Contractor, local environmental authorities, sanitary service, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td></td>
<td>Noise and vibration</td>
<td>Construction site and surroundings</td>
<td>Acoustic measurements, public/personnel complaints</td>
<td>Daily or as deemed necessary during construction</td>
<td>Approved impact limit values</td>
<td>Contractor, sanitary service, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td></td>
<td>Waste generation and management</td>
<td>Construction site and surroundings</td>
<td>Visual inspection, waste inventory, evidence from landfill operator</td>
<td>Continuous daily control</td>
<td>Approved waste generation/disposal limits</td>
<td>Contractor, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td>Construction and Supervision</td>
<td>Surplus activated sludge generation and management</td>
<td>Plant site and surroundings</td>
<td>Visual inspection, waste inventory, evidence from landfill operator</td>
<td>Continuous daily control</td>
<td>Approved waste generation/disposal limits</td>
<td>Contractor, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
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<tr>
<td></td>
<td>Process waste management</td>
<td>Plant site and surroundings</td>
<td>Visual inspection, waste inventory, evidence from landfill operator</td>
<td>Continuous daily control</td>
<td>Approved waste generation/disposal limits</td>
<td>Contractor, local environmental authorities, sanitary service, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
</tbody>
</table>
Ukraine: Urban Infrastructure Project

ENVIRONMENTAL ASSESSMENT REPORT

Odessa Oblast: Belgorod-Dnestrovskiy town

Wastewater Collection/Treatment

Volume 2C

October 2005

DRAFT
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INTRODUCTION

Belgorod-Dnestrovskiy town (till 1944 - Akkerman) is situated in Odessa oblast of Ukraine. There is a landing stage at the Dnister estuary. Food processing industry (meat and fish factories, butter and vine-juce factories); sewing, furniture, paperboard factories, construction material complex are developed. There are marine, fishery, agricultural colleges, pedagogical, medical schools. Nearly-by of Belgorod-Dnestrovskiy is Shabo village where there are large wine factories and grape processing units.

Physical-geographical and climatic characteristics of the region

Belgorod-Dnestrovskiy town is situated on southern fringe of Dnistrovski estuary, 90 km SW from Odessa. The territory is rather even, with a slope to the estuary. There are shallow ravines.

Absolute elevations of the town are from 1 m to 40 m. At the project site absolute evaluations are from 15.2 m to 9.7 m.

Climate of the area is warm, wet, winter is mild and short, summer is hot. The territory is arid, mean annual evaporation from the soil surface is 400 mm.

In winter predominating winds are N, NE and NW. At that average speed of wind is 5 to 8.5 m/s. Summer winds are from S and NW, average speed 4-4.5 m/s.

Freezing depth is 0.8 m.

Geological Situation

The region geological structure is tied with the western part of the Black sea trough. It consists mainly of neogenic, paleogenic, and quaternary deposits. They consist of limestones and sandy-argillaceous rocks.

Recent deposits consist of sandy-argillaceous alluvium. At the project site the rock lithology consists of the embankment layer, the yellowish-brown fine sand of low humidity, and limestone. At the construction depth there is no groundwater. The region seismicity is 6 points.

Further sections of this report describe the proposed improvements and results of the EA. This draft has been reviewed; the review comments will be addressed in the final report.
II. REHABILITATION OF WASTEWATER COLLECTION/TREATMENT SYSTEM

II.1. Existing Situation

II.1.1. General

Belgorod-Dnestrovskiy town has developed sewerage system. It consists of 20 km networks, three main basin pumping stations and a range of small sewage pumping stations. Town wastewaters are delivered to the main pumping station (MPS) (Figure II.1) which supplies sewage treatment station (STS) with influent.

There is an obsolete STS, 5.500 m$^3$/day throughput. It is not working.

There are treatment units of initial 12000 m$^3$/day throughput, designed by the Institute Ukrvyuzhgidrocommunstrooi. In perspective their throughput will amount to 20000 m$^3$/day.

Sewage is delivered to MPS through three sewer mains, along Shabska Str. In the northern part of the town there are two sewer mains, 500 and 600 mm diameter, of reinforced concrete pipes. In the southern part there is one reinforced concrete sewer main 1000 mm diameter. MPS was constructed in 60-es years. Twenty years later was designed new MPS, and they started to construct it. But lack of financing forced to stop its construction. At present 600 mm gravity sewer main installed along Shabska Str. is inoperable, its vault is destroyed.

As a result, at Belgorod-Dnestrovskiy Vodokanal it was decided to reconstruct the main pumping station and to replace existing sewer main with a new one of smaller diameter, as daily volumes of effluents are at present reduced.

The existing sewage treatment station of Belgorod-Dnestrovskiy town consists of the following units: the receiving chamber, the sand catchers, the clarifies, the aerofilters, the secondary sedimentation tank, the contact reservoir, the sludge cards, the chlorinating unit, the workshop, the storehouse, the garage, the boiler house.
The station primary treatment capacity 5,000 m$^3$/day, the secondary treatment 3000 m$^3$/day.

To the treatment plant are also delivered wastewaters of Shabo village, Belgorod-Dnestrovskiy region. Treated wastewater are discharge through the dispersal outlet to the Dnistrovski estuary. The outlet is situated at the high (Western) bank of the estuary. It is an open estuary, directly connected with the sea. It is under influence from the sea and from the Dnister river.

At the wastewater treatment site they are not treating or disinfecting waste sludge. There is no tertiary treatment of wastewaters.

Constructions of the unit for tertiary treatment by coarse grained filters (Figure II.2) was stopped in 1991, due to lack of financing. The unit was ready by 90% in 1991. But in present it is looted and practically destroyed.

At the wastewater treatment station there is also a contact reservoir. Its erection was also stopped in 1991. In the project there are provisions for performance of complete construction of the contact reservoir, because this unit is a part of the tertiary treatment complex.

There are also partially constructed digestion tanks. Their construction needs completing.
II.2. Proposed Investment Projects

The project scope includes:

- Construction of a new gravity sewer main for municipal wastewaters, 1,959 m long, along Shabska Str., at the segment from Ushakov Str. to MPS. Polyethylene pipes, diameter 400 mm, will be used. This collector will be situated close to the existing collector, for facilitation of re-connection of the serviced users in the region;
- Reconstruction of the unfinished main pumping station. Its throughput will be 600 m$^3$/hour. MPS will be equipped with CD 450/22.5 pumps (two operating and one stand-by);
- Construction of 400 mm steal pressure pipelines from the designed MPS to the operating at present pressure pipelines (around the existing MPS). Two lines, 119 m and 25 m long;
- Reconstruction of the wastewater treatment units and the boiler room, construction of the tertiary treatment unit, the contact reservoir, the digestion tanks; general overhaul of buildings and units at the WwTP site.

II.2.1. Gravity Sewer Main

It is proposed to construct along Shabska Str. 400 mm gravity sewer main for exploitation instead of the damaged 600 mm municipal wastewater pipeline.

The gravity sewer main 1,959 m long will be connected to the existing 500 mm sewer main going along Ushakova Str.

The gravity sewer main will be routed along the traffic passage part of Shabska Str. It will be connected with local units.

Along the new gravity sewer main route all sewer mains on neighboring streets will be re-connected to it.

Topographic features of Shabska Str., and connection conditions along Ushakov and Pervomaiska Str., and connections to MPS which will be reconstructed demand the sewer main placing with minimal falls 0.0025.

The sewer main trench depths 1.4-4.4 m is dictated by elevations of outlets from existing mains and users.

The base of the 400 mm gravity sewer main will be 150 mm thick layer of sand (in accordance with the instruction "Units and parts of plastic pipelines for water supply and sewerage systems").

II.2.2. Reconstruction of the Main Pumping Station and Construction of the Pressure Pipelines

The incompletely constructed MPS is situated at 10 m distance from existing MPS. At present there are only building structures (Figure II.3).
Altitudes:
- pumping station floor – 10.45 m;
- flume of the inflow sewer pipelines – 6.65 m;
- machine room floor – 3.35 m.

Operation reliability is of 1st class in accordance with construction demands SNiP 2.04.03-85.

The MPS site is abut on the operation pumping station site. On the same site there are also the following main service lines:
- gravity sewer main;
- pressure pipelines from the pumping station;
- municipal water supply pipeline.

The pumping station design throughput is 600 m³/hour. The project will provide for two pressure pipelines, connecting the pumping station with two existing pipelines 600 mm and 800 mm near the existing MPS.

In accordance with the customer demands the machine room will be provided with CD 450/22.5 pumps. The number of operating pumps is determined with allowance for volumes to be pumped to the pipeline – 600 m³/hour. There will be two operating pumps and two stand-by pumps, one in the machine room and one in the store room.

Volume of the receiving reservoir is 170 m³. It is supplied through 800 mm sewer main. The receiving reservoir is equipped with a unit for stirring-up of sediments. The sediments are washed off through a rubber hose with portable pump.
The grate room is equipped with two mechanical unified grates. One of them is in operation, the other one is stand-by.

There is also a hammer crusher for disintegration of trash. Disintegrated trash is discharged to a reservoir. For non-disintegrating trash a special container is provided.

The main processing equipment is situated in the machine room:
- main operating pumps CD 450/22.5 with 75 kW electric motors. The pumps must be primed;
- two peripheral pumps VK 2-26A-U2 with built-in 1.1 kW electric motors (one in operation, one stand-by);
- drainage immersion pumps GNOM 10-10 with built-in 1.1 kW electric motors (one in operation, one stand-by);
- one jet discontinuity tank MK 833-021 400 l capacity on the water line;
- load lifting equipment: monorail hoist, 4.5 span, 3.2 t capacity.

The project will provide for two diametrically opposite outlets for the pressure pipelines. For this purpose in the wall will be installed seals for pipes 500 mm diameter.

In the pumping station the following processes are automated:
- pumps switching on/off by levels in the receiving reservoir;
- automatic switching on/off the stand-by pump in case of the operating pump failure;
- automatic switching on drainage pumps by levels of water leakage and/or spilling in the machine room;
- automatic closing of 800 mm electrically operated gate on the gravity sewer main delivering wastewaters to MPS, in case of emergency flooding of the machine room;
- automatic switching on of the technical water pump by water level in the jet discontinuity tank, and its operation synchronized with that of CD 450/22.5 pumps.

II.2.3. Reconstruction of Wastewater Treatment Units

The project will provide for increment of the wastewater treatment plant (WwTP) site, with maximal use of the existing units.

The following scheme of water flow us adopted.

Belgorod-Dnestrovskiy town and Shabo village wastewaters are delivered by pressure pipelines to the existing receiving chamber, and from it by gravity flow on sand catchers. From sand catchers wastewater flows to primary sedimentation tanks, and then to the mixing aerotanks.

The project will provide for use of existing air bubblers. From aerotanks and air bubbling wastewaters are additionally treated on drum nets and sand filters. Treated waters are disinfected with liquid chlorine, during 30 min contact in contact tanks, and then they are discharged to a water body, with observation of the necessary degree of dilution.

Raw sedimented sludge from the primary sedimentation tanks are pumped by ram pumps to sludge digestion tanks. Sludge from secondary sedimentation tanks is partially pumped to aerotanks, and excessive sludge is delivered to preaerator (50%) and to sludge thickeners (50%). The thickened activated sludge is pumped to sludge digestion tanks by
pumps installed at the air-blowing pumping station. The sludge digestion are operating under thermophilic conditions. Digested mixture of sediments is delivered for dewatering to sludge cards. Dewatered sludge can be used in agriculture.

The boiling room also should be reconstructed. There is a need in rooms for auxiliary equipment, for cyclone and the vestibule. Over amenity rooms will be constructed air ventilation chambers.

So, for implementation of the project at Belgorod-Dnestrovsky town it will be necessary to provide investment for the following purposes:

- to complete construction of the tertiary treatment unit;
- to complete construction of the contact reservoir;
- to complete construction of the sludge digestion tanks (Figure II.4) and auxiliary premises;
- to reconstruct the boiler room at the site of WwTP;
- to perform general repair of buildings and structures at WwTP site.
II.3. Analysis of Potential Environmental Impacts

II.3.1. Physical Impacts

**Action on the Atmosphere**
The main sources of atmospheric pollution in the process of construction works are exhaust pipes of excavators, bulldozers and cranes; loading-unloading of loose materials, temporary approach roads without hard cover, etc.

Performance of construction works and trucks loading generate inorganic dust containing $\text{SiO}_2$ (20-70%).

Internal combustion engines at the construction site are generating nitrogen dioxide, soot, sulfur dioxide, carbon oxide, and saturated hydrocarbons. At welding stations are generated ferric oxide, manganese and its compounds, hexavalent chrome, nitrogen dioxide, hydrogen fluoride, very soluble fluorides. At painting posts are generated xylol and white-spirits.

Sewage pumping stations are generating ammonia, hydrogen sulfide and methane. Aerial effluents of sewage pumping stations are determinable by instrumental metering. But as at present there is no possibility to perform such metering, the data obtained previously at Odessa WWTS pumping units were used.

These data are as follows:

Ammonia – 0.0014 g/s
Hydrogen sulfide – 0.00024 g/s
Methane – 0.07 g/s.

Aerial effluents dispersal was calculated for $500 \times 500$ m plot. It has been determined that concentrations of pollutants at the dwelling zone boundary were within maximum allowable values for such pollutants, with allowance for the background level of atmospheric pollution, accepted as $0.4C_{\text{max}}$.

Generalized evaluation of the performed computations allows to draw a conclusion, that the sewage pumping station exploitation will not lead to deterioration of the quality of atmospheric air in the near-by dwelling zone.

Process going on at WwTP generate nitrogen dioxide, sulfur oxides, carbon oxides and ash. Also there are aerial effluents of hydrogen sulfide, methane, and ammonia. All effluents are within allowable normative concentrations. The near-earth layer contains allowable concentrations of polluting substances, due to application of technical means of air protection.

**Impact on Water Resources**

Construction and exploitation of the pumping station and feeding pipeline will not affect surface water bodies. The reconstruction project provides for discharge of storm water and protection of groundwater. The underground part of MPS is made of water-tight concrete.

The planned set of complete biological treatment with tertiary treatment and discharge of treated water through a dispersing head will ensure in the calculation section the water quality corresponding to demands of “Rules for protection of surface water against pollu-
tion with wastewaters – $\text{BOD}_{\text{ult}}$ 1.99 mg/l and the sum relationship of harmful substances of the same group by their limiting index of noxiousness to MAC < 1.

The project also provides for a possibility to use a part of the tertiary treated water for agriculture irrigation during vegetative period. And this will lead to reduction of the tertiary treated water discharge to estuary.

**Impact on Soil**

Construction process demand excavation of soil. The excavated soil will be laid along trenches and later used for backfilling. After completion of the construction works, disturbed soil will be technically and biologically recultivated.

Water-transporting communications of the wastewater treatment units are designed in accordance with acting norms and rules, demanding protection of soil against pollution.

The project also will provide for soil recultivation along aerial power lines.

**Flora and Fauna**

Construction of the pumping station and feeding pipelines will not affect near-by natural habitats of flora and fauna. The reconstruction will be performed on already existing objects, situated on built-up territory. There is no tree felling area. When construction operation will be over, an additional landscape gardening on the construction site will be performed.

**Solid Wastes**

Wastewater sludge is a valuable organic-mineral fertilizer. It contains plant nutrients: nitrogen, phosphorous, potassium, and microelements such as boron, copper, molybdenum, etc.

At later stage of the project will be considered a possibility of WwTP waste utilization, in particular for agriculture, after thermophilic fermentation.

The total impact of the project on the environment is presented on the table II.1.

**Table II.1. Total Impact on the Environment**

<table>
<thead>
<tr>
<th>Impact Types</th>
<th>Impact evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact on Atmospheric Air</td>
<td>0.14 MAC around pumping station</td>
</tr>
<tr>
<td>Impact on Water Resources</td>
<td>No impact</td>
</tr>
<tr>
<td>Impact on Soil</td>
<td>Excavated soil will be used for refilling trenches</td>
</tr>
<tr>
<td>Flora and Fauna</td>
<td>No impact. After construction an additional landscape gardening can be performed</td>
</tr>
<tr>
<td>Total Annual Aerial Discharge of Pollutants, t/year</td>
<td>14,319, 3,531, 0,431, 0,562, 4,035, 0,694, 0,0136</td>
</tr>
</tbody>
</table>
II.3.2. Social Impacts

Construction of the pumping station and feeding collectors will provide for a reliable operation of the town sewage lines. This will produce a positive influence on social and sanitary-hygienic situation for Belgorod-Dnestrovskiy population.

The new sewer main will receive industrial effluents from neighboring enterprises, and this will lead to a corresponding improvement in the environment.

Environmental assessment of the project demonstrated that there will be no any impacts on heritage sites. But it should be noted that the main sewer pipeline along Shabska Str. is at 150-200 m from the ancient fortress of historical interest of Tira town.

The sewer main is in a break-down state, and its restoration is a primary task for the Belgorod-Dnestrovskiy Vodokanal, aimed at protection of heritage sites.

Improved quality of treated effluents will make positive indirect impact on recreation capacity of the Dnestrovski estuary, the recreation site for local population and tourists.

The project will not entail involuntary resettlement activity.
II.4. Review of Alternative Options

Alternative options of the sewer main tracing were not considered, because it will serve as substitute for the old sewer main. If take for consideration such alternative as "no project performance" then it is necessary to note that the existing sewer main is in a critical break-down state. Its exploitation can cause emergency situation, leading to wastewater discharge to the environment. So, it is well substantiated to lay the new designed sewer main.

The existing MPS is morally obsolete (it was partially renovated in 80-s years). Unreconstruction of the main pumping station can lead to irreversible ecological shifts, caused by failure of the old MPS.

As to the wastewater treatment units, two variants of their composition were considered.

Variant 1. Complete biological treatment on mixing aerotanks, with tertiary treatment on sand filters, sludge treatment in sludge digestion tanks. With sediment dewatering on sludge cards. This variant is fully described in section II.

Variant 2. complete biological treatment on aerotanks, sludge treatment on mineralizers, tertiary treatment and sludge dewatering as a variant 1.

Also were considered variants of clarifier-digester units and aerating domes application. But such units demand much larger site overspilling boundaries of the allotted site. And there is no possibility to obtain a larger site as nearby is a dwelling area.

On the basis of technical and economic consideration it was decided to accept Variant 1. It will allow to reduce demands on electric energy, to simplify sludge processing, and to use existing structure to full extent.
II.5. Environmental Management Plan

II.5.1. Brief Description of Key Environmental Issues

This investment project is aimed at reconstruction of the existing sewerage system of Belgorod-Dnestrovskiy town. It is aimed at attainment of safe exploitation of the municipal infrastructure of the town.

The main problem of environmental impacts are connected with polluting substances generated during construction of gravity pipeline on Shabska Str.. Also there is a possibility of noise pollution caused by engines of construction machines.

There will be no considerable impact on land. In case of need, a recultivation will be performed.

All outlined impacts in case of need will be minimized by corresponding methods of construction, with observation of all safety and environment protection norms. Internal combustion engines of operating machines will be regulated for minimization of exhaust gases generation. The level of noise will be reduced with the help of:

- installation of ventilation units in isolated places, with vibration isolation;
- absence of rigid connections between air blowers and air ducts;
- installation of insulating pads on windows.

Possibility of ground pollution with wastewaters will be minimized by engineering means applicable in the framework of the project implementation.

II.5.2. Mitigation Plan

The proposed mitigation measures are listed in Annex A.1.

II.5.3. Monitoring Plan

Proposed monitoring plan for the project is presented in Annex B.1.
III. INSTITUTIONAL ISSUES

The Environmental Management Plan will be implemented by the Borrower in order to ensure compliance with existing environmental and sanitary regulations in the process of construction and operation of proposed water supply, wastewater collection and solid waste management facilities in Odessa. Relevant executive authorities will be responsible for overall control and supervision of construction and operation of all proposed facilities. The day-to-day supervision of environmental performance will be part of the design/construction supervision process.

There is no plan for the involvement of non-governmental organizations in the independent monitoring of the project.

IV. PUBLIC CONSULTATION

In accordance with the World Bank requirement, the public consultation process was organized as part of the environmental assessment, in order to discuss the proposed urban infrastructure development projects with various stakeholder groups in Odessa, Teplodar, Illichevsk and Belgorod-Dnestrovskiy. This public consultation involved two stages.

The first public consultation was held on 16 August 2005 to discuss the EA Terms of Reference, EA report structure and preparation schedule. Relevant project information was distributed among the participants present at the meeting.

The second public consultation was held on 9 September 2005 to discuss the results of environmental assessment for all proposed investment projects.

The main objectives of public consultation process are to:

- Ensure transparency of environmental assessment;
- Provide project information to key stakeholder groups;
- Provide a forum for discussion of social/public concerns;
- Receive feedback from key stakeholder groups in order to gain better understanding of their perceptions and expectations.

The following stakeholders should be involved in the public consultation process:

- Project sponsor;
- Local scientific community;
- Representatives of EA/EIA team, experts;
- Statutory and political authorities;
- Local self-governance bodies;
- Trade unions, public groups and political parties;
- Local confessions and religious groups;
- Local communities;
- Other stakeholder groups.

The public consultation on the proposed project provided valuable feedback from various stakeholder, which was taken into account in the present Environmental Assessment report.
CONCLUSIONS

The objective of this Environmental Assessment was to identify and assess the potential environmental impacts associated with the proposed urban infrastructure improvements in Belgorod-Dnestrovskiy town, including:

**Wastewater management improvements:**

- Construction of a new gravity pipeline for municipal wastewaters;
- Reconstruction of the unfinished main pumping station;
- Construction of 400 mm steal pressure pipelines from the designed MPS to the operating at present pressure pipelines
- Reconstruction of the wastewater treatment units.

Based on the results of the Environmental Assessment, it can be concluded that the proposed projects would improve the sanitary and environmental situation in Odessa, and can be promoted to the next stage of project preparation cycle.
ANNEX A – Mitigation Plan
### Annex A.1. Mitigation Plan: Rehabilitation of Municipal Sewer Network

<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Mitigating Measure</th>
<th>Cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
</table>
| Construction           | Potential impact of construction activity on the pedestrian safety in the location of construction site | • Provision of safety fence around the construction site.  
• Restricted access to the construction site on the basis of passes | Allowance made in the project budget | Contractor                  |
|                        | Dust emissions during construction                                      | • Implement dust avoidance measures.  
• Covering of earth/building material transporting vehicles.  
• Watering of access roads and excavation zones, implementation of good construction practice, site cleaning at the end of working hours.  
• Use of protective covers and screens to contain fugitive dust emissions wherever possible. | Allowance made in the project budget | Contractor                  |
| Noise and vibration    |                                                                                       | • Restricting noisy construction activities to normal daily working hours.  
• Adopting a reasonable work schedule.  
• Use of acoustical enclosures or noise suppressors for noisy equipment where appropriate | Allowance made in the project budget | Contractor                  |
| Short-term surface water and soil contamination from leaks or spills of process chemicals such as fuel oils/lubricants, paints, cooling agents etc. |                                                                                       | • Regular inspection and proper maintenance of vehicles and equipment.  
• Provision of adequate containment for fuel oils and lubricants, paints, cooling agents, solvents etc.  
• Prompt elimination and control of leaks and spills.  
• Identification of a minimum required number of delivery routes for fuel and lubricants, cooling agents, paints, solvents and asphalt material to minimize risk of accidental spills and releases.  
• Limiting vehicle maintenance operations to specially designated sites. | Allowance made in the project budget | Contractor                  |
| Short-term groundwater and soil contamination from spills during the connection of new piping to the existing sewer network |                                                                                       | • Strict compliance with construction standards and design specifications | Allowance made in the project budget | Contractor                  |
| Air emissions during equipment operation |                                                                                       | • Ensure proper technical state of all equipment.  
• Restricting construction activities to reasonable working hours. | Allowance made in the project budget | Contractor                  |
| Top soil stripping may affect soil properties |                                                                                       | • Provide adequate temporary storage for top soil material and subsequent restoration of disturbed site | Allowance made in the project budget | Contractor                  |
| Interference with natural drainage |                                                                                       | • Short-term impact. No special mitigation measures are required | Allowance made in the project budget | Contractor                  |
| Damage to trees and other vegetation during construction |                                                                                       | • Minimise the potential for damage.  
• Replant/restore affected vegetation cover | Allowance made in the project budget | Contractor                  |
## Phase Issue Mitigating Measure Cost Institutional Responsibility

<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Mitigating Measure</th>
<th>Cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction waste and old piping can be a potentially significant effect unless properly managed</strong></td>
<td>• All waste materials, generated during construction, including hazardous waste, should be delivered to the official sanitary landfill(s).</td>
<td>Allowance made in the project budget</td>
<td>Contractor</td>
<td></td>
</tr>
</tbody>
</table>
| **Operation** | Odours and noise generated by sewage pumping station can cause considerable nuisance to local residents | • Air emissions from sewer mains should be minimised.  
• Pumping stations should be appropriately located at a sufficient distance from residential areas, in adequately insulated buildings. | Operating cost | Operator |
| **Soil and groundwater contamination due to leaks from sewer system** | • Adequate leak control.  
• Comprehensive quality assurance/control programme during construction, with subsequent technical inspection and maintenance programme | Operating cost | Operator |
ANNEX B Monitoring Plan
### Annex B.1. Monitoring Plan: Rehabilitation of Municipal Sewer Network

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Monitoring Parameter</th>
<th>Monitoring Location</th>
<th>Monitoring Technique</th>
<th>Monitoring Frequency</th>
<th>Performance Target</th>
<th>Institutional Responsibility</th>
<th>Target Audience</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction and Operation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>% of losses in sewer network</td>
<td>Centralized sewer system</td>
<td>Instrumented measurements</td>
<td>Daily during construction, monthly during operation</td>
<td>0%</td>
<td>Contractor, local environmental and water management authorities, sanitary service</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td>Intermediate Performance Indicators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>Groundwater contamination</td>
<td>Storm drains in the locations of sewer collection mains</td>
<td>Instrumented measurements</td>
<td>Daily during construction</td>
<td>Background (baseline) pollutant concentrations in groundwater</td>
<td>Contractor, local environmental and water management authorities, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td></td>
<td>Soil contamination along the sewer collector lines</td>
<td>Monitoring boreholes drilled in the selected locations</td>
<td>Instrumented measurements</td>
<td>Monthly during construction</td>
<td>Background (baseline) levels</td>
<td>Contractor, local environmental authorities, sanitary service, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td></td>
<td>Air emissions</td>
<td>Construction site and surroundings</td>
<td>Instrumented measurements</td>
<td>Daily or as deemed necessary during construction</td>
<td>Approved emission limit values</td>
<td>Contractor, local environmental authorities, sanitary service, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td></td>
<td>Noise and vibration</td>
<td>Construction site and surroundings</td>
<td>Acoustic measurements, public/personnel complaints</td>
<td>Daily or as deemed necessary during construction</td>
<td>Approved impact limit values</td>
<td>Contractor, sanitary service, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td></td>
<td>Waste generation and management</td>
<td>Construction site and surroundings</td>
<td>Visual inspection, waste inventory, evidence from landfill operator</td>
<td>Continuous daily control</td>
<td>Approved waste generation/disposal limits</td>
<td>Contractor, supervisor</td>
<td>Project Management Unit, local State Administration, public</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td>Groundwater contamination</td>
<td>Storm drains in the locations of sewer collection mains</td>
<td>Instrumented measurements</td>
<td>Weekly during operation</td>
<td>Background (baseline) levels</td>
<td>Contractor, local environmental and water management authorities, sanitary service</td>
<td>Sanitary service, local environmental authorities, public</td>
</tr>
<tr>
<td></td>
<td>Soil contamination along the sewer collector lines</td>
<td>Monitoring boreholes drilled in the selected locations</td>
<td>Instrumented measurements</td>
<td>Monthly during operation</td>
<td>Background (baseline) levels</td>
<td>Contractor, local environmental authorities, sanitary service</td>
<td>Sanitary service, local environmental authorities, public</td>
</tr>
<tr>
<td></td>
<td>Air emissions</td>
<td>Along the sewer main route</td>
<td>Instrumented measurements</td>
<td>Daily or as deemed necessary during operation</td>
<td>Approved emission limit values</td>
<td>Contractor, local environmental authorities, sanitary service</td>
<td>Sanitary service, local environmental authorities, public</td>
</tr>
<tr>
<td></td>
<td>Waste generation and management</td>
<td>Along the sewer main route</td>
<td>Visual inspection, waste inventory, evidence from landfill operator</td>
<td>Monthly</td>
<td>Approved waste generation/disposal limits</td>
<td>Contractor, local environmental authorities, sanitary service</td>
<td>Sanitary service, local environmental authorities, public</td>
</tr>
</tbody>
</table>