Environmental and Social Impact Assessment (ESIA) for the Oil Refinery (Stage 1) of the TANECO Oil Refining and Petrochemical Complex, Nizhnekamsk, Republic of Tatarstan, Russian Federation

November 2008 – February 2009
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Environmental and Social Impact Assessment (ESIA) for the Oil Refinery (Stage 1) of the TANECO Oil Refining and Petrochemical Complex

Nizhnekamsk, Republic of Tatarstan,
Russian Federation

Prepared for OAO TANECO
by the ERM Eurasia Limited,

November 2008 - February 2009
ABBREVIATIONS AND DEFINITIONS

Company, TANECO – OAO “TANECO”
Complex – Oil Refining and Petrochemical Complex of OAO “TANECO”
Stage 1/Oil Refinery/Project - Oil refinery including aromatics and hydrocracking units

NIZ – Nizhnekamsk Industrial Zone
SPZ – Sanitary Protection Zone
USPZ – United Sanitary Protection Zone
IFC – International Financial Corporation
IFI – International Financial Institutions
EU – European Union
WHO – World Health Organization
MPC – Maximum Permissible Concentration
SRLI – Safe Reference Levels of Impact
MPE – Maximum Permissible Emissions
MPD – Maximum Permissible Discharge
IUCN – International Union for Conservation of Nature and Natural Resources
EIA – Environmental Impact Assessment
ESIA – Environmental and Social Impact Assessment
FWCC – Federal Waste Classification Catalogue
RF – Russian Federation
RT – Republic of Tatarstan
OAO – Open Joint-stock Company
ZAO – Private Joint-stock Company

Baseline concentration - present concentration on the Project site without emissions from the Project

Baseline conditions - present conditions of the environment on the Project site prior to the Project construction and operation

Rostekhnadzor – Federal Service for supervision of Environment, Technology and Nuclear Management
Rospririodnadzor – Federal Service for Supervision of Nature Resources
Rosselkhoznadzor – Federal Service for Supervision for Veterinary and Phytosanitary Supervision and Federal Agency for Fishery

Footnote 1: During ESIA process the following two ways of baseline concentration estimation has been used:
- the baseline concentrations calculated for each pollutant as statistically reliable maximum instantaneous concentrations, the values of which are exceeded in 5% of cases (field measurements), characterize the atmospheric air pollution caused by other emission sources in the areas adjacent to the TANECO Complex site;
- the baseline concentrations calculated for each pollutant based on the parameters of present air emission sources of the Nizhnekamsk Industrial Zone.
Rospotrebnadzor - Federal Service for Supervision of Consumers Protection and Welfare
RosVodResources - Federal Agency for Water Resources
DISCLAIMER

ERM confirms that this Report has been prepared with all reasonable skill, care and
diligence and in conformity with the professional standards as may be expected from
a competent and qualified consultant acting as Environmental Consultant having
experience in providing services for projects with similar scope of work, complexity,
issues and scales.

The report is based upon the application of scientific principles and professional
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The conclusions and recommendations made in this Report are based upon
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The conclusions and recommendations made in this Report refer to the period up to
the end of October 2008. ERM is not responsible for any possible changes in the
Project or its environment which may occur after 31 October 2008.
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APPENDICES
1 COMPANY’S POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

1.1 BACKGROUND AND OBJECTIVES OF THE PROJECT

The Project for construction and operation of an oil refining and petrochemical complex (the Complex) in Nizhnekamsk was initiated in 2005 within the framework of the program for the development of oil and gas sector and chemical industry in the Republic of Tatarstan. This program is aimed at generating a twofold increase in the volume of crude oil processing from 7 to 14 million tonnes per year. The implementation of this program was commenced pursuant to decisions taken by the Security Council of the Republic of Tatarstan on 09 June 2005, a decree by the Cabinet of Ministers of the Republic of Tatarstan, and a decision by the Board of Directors of OAO “Tatneft” on 26 July 2005.

In 2006, a Federal status was assigned to the development of the Complex within the framework of the development of the oil refining sector in the Russian Federation. In 2007, an investment agreement between the Federal Agency of Railroad Transport (‘RZhD’), the Federal Agency of Energy (‘RosEnergo’) and the OAO “Tatneft” Company was signed in the RF Ministry of Economic Development and Trade to implement the construction project of the Complex in Nizhnekamsk.

The Project Site is located within the Nizhnekamsk Industrial Zone in the Republic of Tatarstan at a distance about 236 km to the East from the city of Kazan (the capital of this Republic).

The Complex is being developed by Tatneft (the main Sponsor) and OAO “TANECO”, the Project Company and will be built in three stages:

- Oil refinery (“Stage 1” or the “Project”);
- Deep conversion plant (“Stage 2”);
- Petrochemical plant (“Stage 3”).

The following infrastructure facilities are planned to be built:

- Offsite railroad transport facilities;
- Offsite crude oil pipeline;
- Offsite transport facilities for petroleum products (upgrade of the existing oil products trunk pipeline Nizhnekamsk – Almetyevsk – Kstovo).

RZhD and RosEnergo will be responsible for the construction of the off-site railroad facilities and oil pipelines respectively in accordance with the Investment Agreement of 03.08.2007 concluded between RosEnergo, RZhD and OAO “Tatneft”.

The Oil Refinery which constitutes the Stage 1 has the objective of processing a mixture of 75% of Devonian oil and 25% of Carboniferous oil.
After completion of the 3 stages, the Complex will ensure production of jet fuel and fuel which meets European quality standards, complying therefore with the current and future requirement of minimizing the use of high-sulfur fuels.

The construction of a new refining and petrochemical complex using state-of-the-art technologies as it will improve the quality and competitiveness of fuels and petroleum products manufactured in Russia.

OAO Tatneft and the other Sponsors are currently focusing on the development of Stage 1 (the Oil Refinery). The decision to proceed with Stages 2 and 3 will be taken after completion of Stage 1 refinery based on prevailing market conditions.

For the sake of clarity, this ESIA assesses only the environmental and social impacts of Stage 1 (the Oil Refinery).

The ESIA has been prepared in conformity with the requirements of International Financial Institutions and in compliance with the Equator Principles and IFC, as well as associated EHS performance standards applicable for project investments.

1.2 **THE COMPANY’S POLICY AND ENVIRONMENTAL PRINCIPLES**

One of the main priorities of the OAO “TANECO” (the Project Company) is to ensure environmental safety during construction and operation of the Oil Refinery.

OAO “TANECO” has adopted an environmental policy which aims at complying with national and international environmental, health and safety (EHS) norms and standards applicable during the construction and operation of the Oil Refinery.

As stated in its policy, the Project Company will:

- develop and certify appropriate environmental management system complying with the applicable Russian and international standards for such environmental management systems;
- conduct regular monitoring of the environmental conditions during the construction and the operation phases; and
- ensure high level of qualification and professional experience of the operating personnel with respect to environmental safety of operations.

To that extend, the Company had required in the selection process of contractors that EPC contractors to have an effective internal management system of environmental, health and safety standards.
1.3 NATIONAL ENVIRONMENTAL LEGISLATION APPLICABLE TO THE PROJECT

This Section reviews the Russian national environmental legislation applicable during construction and operation of the Oil Refinery.

1.3.1 Regulatory Framework Review

The basic law specifying the rights and responsibilities of the RF citizens in the field of environment protection is the Constitution of the Russian Federation. Article 42 of the Constitution lays down the right of any RF citizen for a “favorable environment, reliable information about its condition and compensation for any damage inflicted to health or property due to environmental delinquent acts”.

The main legal document which regulates environment protection is the Federal Law of the Russian Federation “On Environment Protection” (No.7-FZ of 10.01.2002, revision of 14.07.2008). The law establishes the legal framework for the state environmental policy and regulates the relations between society and nature, in the course of commercial or other activities which could have an impact on the environment. According to Article 34 of this Law “site selection, planning, construction, refurbishing, commissioning, operation, conservation and liquidation of any buildings, constructions, installations and other facilities having direct or indirect negative impact on the surrounding environment shall be performed in conformity with the environmental protection requirements”. At the same time, measures should be taken to protect and restore the environment, natural resources shall be used and recovered in a sound and consistent way in order to ensure environmental safety.


The Water Code of the Russian Federation (No.74-FZ of 03.06.2006, revision of Federal Laws No.201-FZ of 04.12.2006, No.102-FZ of 19.06.2007 and No.118-FZ of 14.07.2008) specifies the basic provisions for the use and protection of water bodies. Among other things, it permits construction and operation of industrial facilities in water protection zones provided that any negative impact on the respective water bodies is ruled out.

protection of the population, land, water and air against any emergency situation.

The Federal Law “On Industrial and Domestic Waste” (No.89-FZ of 24.06.1998, revision of 08.11.2007) lays down the legal basis for waste management in order to prevent adverse impacts to human health and to the natural environment.

1.3.2 General requirements for the Protection of Environment and Public Health

**RF Urban Development Code (No.190-FZ of 29.12.2004)**

The Urban Development Code regulates engineering surveys, the preparation of design documentation for any type of construction and modernization projects, procedures for approval of design documentation, and state supervision over construction activities.

In conformity with Article 47 of the Code, it is required to carry out engineering surveys (including environmental surveys depending on the level of complexity and potential hazard of the planned facilities) in the area of planned construction. The design (project) documentation and the results of engineering surveys are reviewed by the State special agency GlavGosExpertiza of Russia for final approval with the objective of assessing their compliance with national technical regulations, including sanitary epidemiological and environmental requirements, the requirements for state protection of cultural heritage, fire safety, industrial safety and other safety requirements.


This Law sets basic requirements for site selection, design development, construction and operation of commercial facilities.

<...> Site selection, design development <...> of facilities posing direct or indirect negative impact on the environment shall be carried out in conformity with the requirements for environment protection. Measure should be taken to protect and restore the natural environment and ensure environmental safety.


In accordance with Article 11 of this Law any legal entity should:

- Ensure safety for human health during any work execution or services provision, as well as during production for industrial and technical application;

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• Carry out routine monitoring (in particular by means of laboratory analyses and testing) of compliance with sanitary norms and implement sanitary anti-epidemic (preventive) measures in the course of performance of work and services, as well as during manufacturing, transportation, storage and sale of products;
• Inform in a timely manner local communities, local self-government bodies and state sanitary epidemiological supervisory agencies about any accidents, emergencies, shutdown of production facilities, violations of process specifications, etc., posing a threat to sanitary wellbeing of communities.

1.3.3 Atmospheric Air Protection


The Law sets the basic principles of atmospheric air protection, including requirements for air protection measures for different types of commercial activities and operations.

According to Article 16, it is necessary to ensure that site selection process <…> of facilities for commercial and other activities complies with the norms of atmospheric air quality in conformity with the relevant environmental, sanitary and hygienic standards and regulations.

In order to protect the ambient air quality in residential areas, sanitary protection zone are to be established around industrial enterprises (or groups of enterprises). The regulatory dimensions of such sanitary protection zones are determined based on calculations of dispersion of emitted harmful pollutants into the atmospheric air and in compliance with the sanitary classification of enterprises.

The design documentation for construction of facilities, which might cause harmful impact on the atmospheric air, should include measures aimed at reducing air emissions and mitigating their impacts.

Sanitary Epidemiological Rules and Norms SanPiN 2.2.1./2.1.1.1200-03 (new revision) “Sanitary Protection Zones and Sanitary Classification of Industrial Enterprises, Installations and Facilities” approved by the Chief State Sanitary Physician of the RF (Decree No.74 of 25.09.2007)

According to this SanPiN Norm, any oil refining operations are rated as Class 1 and the regulatory sanitary protection zone for such enterprises is established as 1,000m.

The approximate size of a sanitary protection zone (SPZ) is a territory of limited use and is aimed at reduction of adverse impact to acceptable levels.

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3 Sanitary Protection Zones (SPZ) or United Sanitary Protection Zones (USPZ) are set for facilities which emit pollutants into the atmosphere or have other environmental impacts. SPZ or USPZ is a buffer zone between the operation site and residential areas is aimed at protection of population from industrial hazards impact (noise, air emissions, etc.). SPZ or USPZ is designed so that at the boundary of SPZ or USPZ the air pollutant concentrations are less than or equal to 1.0MPC (air quality requirements). The SPZ area standard size is determined by the RF regulations depending on the type of operations. The SPZ area standard size can be enlarged or reduced by the RF sanitary authority based on the design calculations or environmental monitoring results.
set by the Russian norms) as specified in the new revision of SanPiN 2.2.1./2.1.1.1200-03 should be substantiated in a separate SPZ design. It should contain calculations of expected levels of ambient air pollution (taking into account also the baseline level); physical impact factors; and the calculations should be confirmed by field testing.

The Project will be located in the “Lower Kama” industrial zone.

In accordance with SanPiN 2.2.1./2.1.1.1200-03 (new revision, par. 3.13), the dimensions of a sanitary protection zone for a group of industrial facilities, or within an industrial zone, is to be established via a summation of all air emissions and physical impacts from sources present within the industrial zone. In such a case, a united sanitary protection zone is established with calculated dimensions based on the results of performed field measurements and completion of an assessment of risks to public health. The assessment of risks to public health from an industrial zone should include all facilities of hazard classes I, II and III, as well as facilities causing emissions of pollutants containing substances of hazard class I and II and carcinogens.

Sanitary Epidemiological Rules and Norms SanPiN 2.1.6.1032-01 “Hygienic Requirements to Atmospheric Air Quality in Residential Areas”, approved by the Chief State Sanitary Physician of the RF (Decree No.14 of 17.05.2001)

In the process of site selection, design development, construction, commissioning and operation of new or modernized facilities, any development company should take measures to minimize emissions of pollutants to the atmosphere by using low-waste and zero waste technologies; planning and implementing integrated use of natural resources; and introducing measures for the recovery, decontamination and utilization of harmful emissions and wastes.

Hygienic Norms GN 2.1.6.1338-03 “Maximum Permissible Concentrates of Pollutants in Atmospheric Air in Residential Areas”, approved by the Chief State Sanitary Physician of the RF (Decree No.114 of 30.05.2003), Revision of 03.11.2005, with amendments of 04.02.2008

This document specifies the Maximum Permissible Concentration (MPC) values for pollutants in atmospheric air in residential areas. These concentrations should be complied with at the boundary of the sanitary protection zone.

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4 In accordance with SanPiN 2.2.1./2.1.1.1200-03 (new revision) and the List of Top-priority Environmental Actions for the city of Nizhnekamsk and for Nizhnekamsk District of the Republic of Tatarstan for 2006-2008 approved by the Cabinet of Ministers of the Republic of Tatarstan (Decree No.197 of 21.04.2006), the Kazan Research and Production Department “Orgneftehimzavod” developed and had approved a united sanitary protection zone design for the enterprises of the Lower Kama industrial zone.

5 There are also some amendments approved by the Chief State Sanitary Physician of the RF (No.6 of 04.02.2008) “On approval of Hygienic Norm GN 2.1.6.2326-08” (along with the Hygienic Norm “Maximum Permissible Concentrations (MPC) of Pollutants in Atmospheric Air in Residential Areas”, GN 2.1.6.1338-03). Registered by the RF Ministry of Justice (No. 11260 of 29.02.2008). Applicable are also Hygienic Norm GN 2.1.6.1983-05 “Maximum Permissible Concentrations (MPC) of Pollutants in Atmospheric Air in Residential Areas. Supplements and Amendments No.2 to GN 2.1.6.1338-03” and GN 2.1.6.1984-05 “Safe Reference Levels of Impact (SRLI) of Pollutants in Atmospheric Air in Residential Areas. Supplements and Amendments No.2 to GN 2.1.6.1339-03”, approved by the Chief State Sanitary Physician of the RF (No.24 of 03.11.2005), Revision of 04.02.2008, “On Introduction of Hygienic Norms GN 2.1.6.1983-05 and GN 2.1.6.1984-05”.
1.3.4 Management of Hazardous Waste

(Revision of 08.11.2007)

When constructing and operating new facilities the Developer should (Article 10 of the Law):

• comply with the applicable environmental, sanitary and other requirements set by the legislation of the Russian Federation relating to protection of the environment and human health; and
• have prepared technical documentation for the management and disposal of waste generated at any stage of the Project implementation.

Measures to be used for waste management should be developed taking into account the respective hazard class of waste and the regulatory requirements referring to its disposal and reuse.

1.3.5 Protection of Water Bodies


The possible impact of the Oil Refinery on water bodies should be taken into consideration in the process of site selection, design development and construction (Article 105).

Operation of facilities designed for crude oil and/or storage oil products is prohibited without the provision of processes and equipment for the prevention of pollution of water bodies; and instrumentation for the monitoring and detection of oil and/or oil product spills.

1.3.6 Protection of Land Resources


Land owners, land users and land lessees are obliged to:

• take measures to protect land resources and prevent land contamination with chemical substances, industrial and domestic waste and other negative (harmful) impacts causing land deterioration;
• clean up existing soil contamination.

---

Sanitary Epidemiological Rules and Norms SanPiN 2.1.7.1287-03 “Sanitary Epidemiological Requirements to Soil Quality”, approved by the Chief State Sanitary Physician of the RF (Decree No.53 of 17.04.2003)

The sanitary norms set requirements for soil quality in residential areas and agricultural lands, and require compliance with the relevant hygienic norms for site selection, design development, construction, modernization (technical modification) and operation of facilities for various applications, including those which might have adverse impact on the soil condition.

During the design development phase, a survey of the construction site should be carried out on the basis of an extensive list of pollution indicators in areas of waste dumps, industrial facilities, filling stations, etc.

The findings of a soil quality survey are to be submitted to the state sanitary epidemiological supervisory agency, which should in turn issue a statement of compliance of the soil quality with the applicable sanitary epidemiological norms and rules, as well as possibility for use of a given land plot for planned activity.

1.3.7 Operational Safety

Federal Law “On Operational Safety of Hazardous Industrial Facilities”
(Revision of 18.12.2006)

According to the classification specified in Annex 1 of this Federal Law, Stage 1 and moreover the whole Complex is rated as hazardous industrial facility. Therefore It is compulsory for the Project to obtain a positive statement of its operational safety from the state agency GlavGosExpertiza. As mentioned below (see Section 1.6), the Project obtained such positive statement as part of the final approval from GlavGos Expertiza.

(Revision of 30.10.2007)

Any organization is obliged to:

a) plan and implement required measures to protect its employees and industrial and social facilities against emergency situations;

b) plan and implement measures to improve the stability of operations and ensure the safety of personnel in case of emergencies;

c) ensure establishment, training and maintenance of preparedness of personnel and resources for the prevention of, and response to, emergency situations; and to train the personnel to protect themselves and act properly in case of emergencies;

---

d) install and maintain, in intact condition, local warning systems to warn personnel about emergencies;

e) ensure organization and implementation of emergency response and rescue operations at an organization’s facilities and in adjacent areas in accordance with the emergency prevention and response plans;

f) finance measures aimed at protecting the personnel and its facilities of industrial and social character in case of emergencies;

g) create reserves of financial and material resources for emergency response;

h) provide information relating to the protection of population and territories against emergency situations according to the prescribed procedure, and inform the organization’s employees about a threat or occurrence of emergency situations.

1.4 **APPLICABLE INTERNATIONAL CONVENTIONS, REQUIREMENTS OF INTERNATIONAL FINANCIAL INSTITUTIONS AND BEST AVAILABLE TECHNIQUES**

1.4.1 **International Conventions**

The international conventions ratified by the Russian Federation and applicable to the construction and operation of an Oil Refinery (Stage 1) are listed in Table 1.4-1.

**Table 1.4-1. International conventions relating to environmental and social aspects**

<table>
<thead>
<tr>
<th>Year of signing</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventions relating to flora and fauna</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td>Convention on the Conservation of the European Wildlife and Natural Habitats (Bern Convention)</td>
<td>Applicable to the Oil Refinery because some flora and fauna habitats are in the zone affected by the planned Complex.</td>
</tr>
<tr>
<td>1992</td>
<td>Convention on Biological Diversity, Rio de Janeiro</td>
<td>Applicable to the Oil Refinery because some ecosystems are in the zone affected by the planned Complex.</td>
</tr>
<tr>
<td>1979</td>
<td>Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), Bonn</td>
<td>Applicable to the Oil Refinery because migration routes of some migrating animal species might cross the zone affected by the planned Complex.</td>
</tr>
<tr>
<td>Year of signing</td>
<td>Description</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>Climate conventions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992, New York</td>
<td>United Nations Framework Convention on Climate Change</td>
<td>Applicable to the Oil Refinery because the operation of the Project will cause certain changes in amounts of greenhouse gas emissions.</td>
</tr>
<tr>
<td>1997, Kyoto</td>
<td>Kyoto Protocol</td>
<td></td>
</tr>
<tr>
<td><strong>Conventions on Air Protection</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Social issues/Consultations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998, Aarhus</td>
<td>Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters (Aarhus Convention)</td>
<td>Applicable to the Oil Refinery because of the need to inform the public about the environmental impact of the Project.</td>
</tr>
<tr>
<td>1966</td>
<td>ILO Convention 122 “Employment Policy”</td>
<td>The Convention is applicable.</td>
</tr>
<tr>
<td>1977</td>
<td>ILO Convention 142 “Occupational orientation and occupational training for development of human resources”</td>
<td>Applicable to the Oil Refinery because TANECO pursues an active policy of recruitment and training of potential employees.</td>
</tr>
<tr>
<td><strong>Occupational health conventions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1978, Geneva</td>
<td>ILO Convention 150 “Labor Regulations: Role, Functions and Organization”.</td>
<td>The Convention is applicable. Measures for regulation of labor issues are to be taken at the national, regional and local levels, as well as at the level of different sectors of economic activities.</td>
</tr>
<tr>
<td>1999</td>
<td>ILO Convention 182 “Worst Forms of Child Labour”</td>
<td>Applicable to companies. It prohibits worst forms of child labor (a child is any person in an age below 18 years)</td>
</tr>
<tr>
<td>1936</td>
<td>ILO Convention 52 “Annual Vacations with Pay”</td>
<td>Applicable</td>
</tr>
<tr>
<td>1949</td>
<td>ILO Convention 95 “Protection of Wages”</td>
<td>Applicable</td>
</tr>
<tr>
<td>1932</td>
<td>ILO Convention 29 “Forced or Compulsory Labor”</td>
<td>Applicable</td>
</tr>
<tr>
<td>1957</td>
<td>ILO Convention 47 “Forty Hour Week”</td>
<td>Applicable</td>
</tr>
<tr>
<td>Year of signing</td>
<td>Description</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------</td>
<td>---------------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>1950</td>
<td>ILO Convention 87 “Freedom of Association and Protection of the Right to Organise”</td>
<td>Applicable</td>
</tr>
<tr>
<td>1951</td>
<td>ILO Convention 98 “Right to Organise and Collective Bargaining”</td>
<td>Applicable</td>
</tr>
<tr>
<td>1953</td>
<td>ILO Convention 100 “Equal Remuneration”</td>
<td>Applicable</td>
</tr>
<tr>
<td>1952</td>
<td>ILO Convention 103 “Maternity Protection” (revised)</td>
<td>Applicable</td>
</tr>
<tr>
<td>1959</td>
<td>ILO Convention 105 “Abolition of Forced Labor”</td>
<td>Applicable</td>
</tr>
<tr>
<td>1958</td>
<td>ILO Convention 111 “Discrimination (Employment and Occupation)”</td>
<td>Applicable</td>
</tr>
<tr>
<td>1963</td>
<td>ILO Convention 119 “Guarding of Machinery”</td>
<td>Applicable</td>
</tr>
<tr>
<td>1976</td>
<td>ILO Convention 138 “Minimum Age for Employment”</td>
<td>Applicable</td>
</tr>
<tr>
<td>1979</td>
<td>ILO Convention 148 “Working Environment (Air Pollution, Noise and Vibration)”</td>
<td>Applicable</td>
</tr>
<tr>
<td>1983</td>
<td>ILO Convention 155 “Occupational Safety and Health”</td>
<td>Covers all sectors of economic activities and all employees.</td>
</tr>
<tr>
<td>1983</td>
<td>ILO Convention 156 “Workers with Family Responsibilities”</td>
<td>Applicable to employees having family responsibilities</td>
</tr>
<tr>
<td>1986</td>
<td>ILO Convention 162 “Labor Protection against Use of Asbestos”</td>
<td>Applicable in case of use of asbestos-containing materials</td>
</tr>
</tbody>
</table>

### 1.4.2 Applicable Guidelines of International Financial Institutions

The main guidelines issued by IFIs and applicable to this Project are listed in Table 1.4-2.

#### Table 1.4-2. Main Guidelines of International Financial Institutions

<table>
<thead>
<tr>
<th>Date of adoption</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2006</td>
<td>The Equator Principles</td>
<td>Adopted by a group of major financial institutions (banks) and based on the policy and guidelines of the International Financial Corporation.</td>
</tr>
<tr>
<td>Date of adoption</td>
<td>Description</td>
<td>Comments</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>July 2007</td>
<td>Revised recommendations of the Organization for Economic Cooperation and Development (OECD) referring to general approaches for the identification and the assessment of environmental impact in case of project financing.</td>
<td>OECD recommendations are applied by the world’s leading financial organizations when making decisions related to financing of projects with a repayment period of 2 years and more. In general, the OECD recommendations are similar to the Equator Principles regarding key issues (e.g. categorization, environmental review, etc.).</td>
</tr>
<tr>
<td><em>World Bank</em></td>
<td>The operating environmental and social policies of the World Bank:</td>
<td>Applicable to projects financed by the World Bank.</td>
</tr>
</tbody>
</table>
• 4.12 Involuntary Resettlement  
• 4.04 Natural habitats  
• 4.36 Forests | |
| *International Financial Corporation* | IFC Policy and the following Performance Standards relating to social and environmental sustainability: | The IFC Policy and Performance Standards are applicable to all projects financed by the IFC. |
| April 2006 | • PS1: Social and Environmental Assessment and Management System;  
• PS2: Labour and Working Conditions;  
• PS3: Pollution Prevention and Abatement;  
• PS4: Community Health, Safety and Security;  
• PS5: Land Acquisition and Involuntary Resettlement;  
• PS6: Biodiversity Conservation and Sustainable Natural Resource Management | |
| July 2007 | Guidelines on Performance Standards of Social and Environmental Sustainability | IFC guidelines are applicable to all projects financed by the IFC. |
| 30 April, 2007 | IFC General EHS Guidelines | |
| 30 April, 2007 | IFC EHS Guidelines for oil terminals | |

* IFC Performance Standards 7 and 8 are not applicable to the TANECO Project
According to the Equator Principles’ categorisation (Principle 1), the Oil Refinery is rated as Category A. This means that the development of an environmental and social impact assessment (ESIA) for such project is compulsory.

### 1.4.3 Best Available Techniques Applicable to Oil Refining

The basic EU Directive relating to control and regulation of environmental impacts is the EU Directive No. 96/61/EC of 24.09.1996 on integrated pollution prevention and control. It establishes a regulation system based on the use of an integrated approach to control and mitigate environmental impacts from industrial facilities.

The EU Directive 96/61/EC does not specify any maximum permissible values for emissions, but defines recommended schemes for design, development and operation of equipment to ensure environmental protection by application of the Best Available Techniques (BAT).

In addition, there is a series of documents developed (Reference documents on best available techniques - BREF), which are to be used by the EU member countries when selecting general best available techniques.

For Stage 1, the following BREF reference documents are applicable:

- Reference document on best available techniques for industrial cooling systems (adopted in December 2001);
- Reference document for main monitoring principles (adopted in July 2003);
- Reference document on best available techniques for oil and gas processing plants (adopted in February 2003);
- Reference document on best available techniques for emissions from storage tanks (adopted in July 2006);
- Reference document on best available techniques for waste processing plants (adopted in August 2006);
- Reference document on best available techniques for energy efficiency (final version for presentation, March 2008).

The above documents contain information about the basic production flow diagrams; requirements for the operation of facilities; recommended maximum permissible values for emissions; energy efficiency indicators, and appropriate monitoring procedures.
To assess the levels of permissible environmental impacts of Stage 1 the following environmental standards have been used:

- Maximum permissible concentrations of pollutants in atmospheric air and in surface water bodies in accordance with the RF norms;
- Maximum permissible concentrations of pollutants for oil refining and petrochemical sector recommended by the World Bank and the IFC;
- Maximum permissible noise levels established by the national legislation of Russia and the regulatory documents of international organizations (WHO, World Bank Group);
- Recommended permissible concentrations in air emissions recommended by the WHO;
- Criteria for permissible contents of pollutants in soils specified in the Russian norms and in the Dutch Soil Standards (the Dutch List).

The Russian norms specify requirements for ambient air quality in residential areas, which is assessed by two indicators: the maximum instantaneous concentrations (this is established for the prevention of adverse impacts to human health in case of short-term duration exposure) and average daily maximum permissible concentrations of pollutants (this is established for the prevention of adverse impacts to human health in case of a long period exposure).

Table 1.5-1 presents a comparison of the requirements of the WHO, the EU norms and Russian norms for ambient air in residential areas.

**Table 1.5-1. MPC values for concentrations of pollutants in ambient air in residential areas in conformity with the WHO, EU and Russian standards**

<table>
<thead>
<tr>
<th>Pollutants, (mg/m³)</th>
<th>Russian Norms</th>
<th>WHO</th>
<th>EU Directive²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum instantaneous concentration</td>
<td>Daily average concentration</td>
<td>1 hour</td>
</tr>
<tr>
<td>Nitrogen dioxide NO₂</td>
<td>0.2</td>
<td>0.04</td>
<td>0.2</td>
</tr>
<tr>
<td>Sulphur dioxide SO₂</td>
<td>0.5</td>
<td>0.05</td>
<td>0.5 for 10 min</td>
</tr>
<tr>
<td>Hydrogen sulfide H₂S</td>
<td>0.008</td>
<td>0.003</td>
<td>-</td>
</tr>
<tr>
<td>Carbon</td>
<td>-</td>
<td>-</td>
<td>6 (for 8)</td>
</tr>
</tbody>
</table>

² EU Directive 2008/50/EC of 21.05.2008 on ambient air quality and cleaner air for Europe
Table 1.5-2 contains the overall regulatory maximum permissible concentrations of pollutants for water bodies of fishery significance in the RF.

**Table 1.5-2. Overall maximum permissible levels of pollutant concentrations in water bodies of fishery significance applicable in the RF**

<table>
<thead>
<tr>
<th>Parameter (pollutant)</th>
<th>Category of fishery water body</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Highest and First</td>
</tr>
<tr>
<td>pH value</td>
<td>6.5-8.5</td>
</tr>
<tr>
<td>BOD(_{total}), mg/dm(^3)</td>
<td>3</td>
</tr>
<tr>
<td>Suspended matter, mg/dm(^3)</td>
<td>Increase in natural concentration by ≤0.25</td>
</tr>
<tr>
<td>Petroleum hydrocarbons, mg/dm(^3)</td>
<td>0.05</td>
</tr>
<tr>
<td>Phenol, mg/dm(^3)</td>
<td>0.001</td>
</tr>
<tr>
<td>Copper, mg/dm(^3)</td>
<td>0.001</td>
</tr>
<tr>
<td>Iron, mg/dm(^3)</td>
<td>0.1</td>
</tr>
<tr>
<td>Nickel, mg/dm(^3)</td>
<td>0.01</td>
</tr>
</tbody>
</table>

The main values of pollutants contents in surface water bodies in accordance with the EU norms are given in Table 1.5-3.

**Table 1.5-3. Selected MPC values for pollutants in surface water bodies according to EU Norms**

<table>
<thead>
<tr>
<th>Pollutant (mg/dm(^3))</th>
<th>European Union(^9)</th>
</tr>
</thead>
</table>

---

\(^9\) Proposal for EU Directive on Environment Quality Standards relating to protection of water resources and supplement to EU Directive 2000/60/EC.
## Average annual value | MPC
--- | ---
Lead | 7.2 | -
Nickel | 20 | -
Mercury | 0.05-0.25 | 0.07
Benz(a)pyrene | 0.05 | 0.1
1,2-dichloroethane | 10 | -
Cadmium | 0.08-0.25 | 0.45-1.5
Benzene | 10 | 50

Table 1.5-4 contains the requirements of the IFC standards to air emissions and wastewater discharge of pollutants from oil refineries and petrochemical plants.

### Table 1.5-4. Requirements of standards of IFC for air emissions and discharge of pollutants in oil refining and petrochemical industry

| Parameters (Pollutants) | Description of standards | IFC
| --- | --- | --- |
| EHS Guidelines for the manufacturing of petroleum-containing organic substances | EHS Guidelines for the manufacturing of petroleum-containing polymers | EHS Guidelines for oil refineries

<table>
<thead>
<tr>
<th>Air emission maximum concentrations at emission sources, mg/m³</th>
<th>Solid impurities</th>
<th>Nitrogen oxides</th>
<th>Hydrochloride</th>
<th>Sulfur oxides</th>
<th>1,2-dichloroethane</th>
<th>Vinyl chloride</th>
<th>Akrylnitril</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid impurities</td>
<td>20</td>
<td>20</td>
<td>450</td>
<td>150 (for sulfur removal installations)</td>
<td>500 (for other facilities)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen oxides</td>
<td>300</td>
<td>300</td>
<td></td>
<td>500 (g/t PVC suspension)</td>
<td>500 (g/t PVC emulsion)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrochloride</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulfur oxides</td>
<td>100</td>
<td>500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,2-dichloroethane</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vinyl chloride</td>
<td>5</td>
<td>80 (g/t PVC suspension)</td>
<td>500 (g/t PVC emulsion)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Akrylnitril</td>
<td>0.5 (combustion). 2 (gas cleaning)</td>
<td>5 (15 for drying chambers)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

10 Industry specific guidelines are providing values (based on the best available practice) which should be achieved at each point source of air emissions typical for this industry.

11 EHS Guidelines for large-scale production of petroleum-containing and organic compounds, March 2 – April 30, 2007 (International Financial Corporation, World Bank Group)

12 EHS Guidelines for manufacture of petroleum-containing polymers, April 30, 2007 (International Financial Corporation, World Bank Group)

13 EHS Guidelines for oil refineries, April 30, 2007 (International Financial Corporation, World Bank Group)
<table>
<thead>
<tr>
<th>Parameters (Pollutants)</th>
<th>Description of standards</th>
<th>IFC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EHS Guidelines for the manufacturing of petroleum-containing organic substances(^1)</td>
<td>EHS Guidelines for the manufacturing of petroleum-containing polymers(^2)</td>
</tr>
<tr>
<td>Ammonia</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Volatile organic compounds (VOC)</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Heavy metals (total content)</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Mercury and its compounds</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>Ethylene</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Ethylene oxide</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Hydrocyanide</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Nitrobenzene</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Organic sulfides and mercaptans</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Phenols, creosols and xylenes (such as phenol)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Benzene</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Caprolactam</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Dioxins (furans)</td>
<td>0.1 (ng of toxic equivalent /Nm(^3))</td>
<td>0.1 (ng total equivalent /nanometer cubic)</td>
</tr>
</tbody>
</table>

**Characteristics of wastewater released to water bodies, mg/l**

<table>
<thead>
<tr>
<th></th>
<th>pH value</th>
<th>BOD</th>
<th>COD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6-9</td>
<td>6-9</td>
<td>6-9</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Suspended matter</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Petroleum hydrocarbons</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Chromium (total)</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Chromium (hexavalent)</td>
<td>0.1</td>
<td>0.1</td>
<td>0.05</td>
</tr>
<tr>
<td>Lead</td>
<td>0.5</td>
<td>0.5</td>
<td>0.1</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Phenol</td>
<td>0.5</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>Iron</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benz(a)pyrene</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parameters (Pollutants)</td>
<td>Description of standards</td>
<td>IFC</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EHS Guidelines for the manufacturing of petroleum-containing organic substances(^{11})</td>
<td>IFC Guidelines for the manufacturing of petroleum-containing polymers (^{12})</td>
<td>EHS Guidelines for oil refineries(^{13})</td>
</tr>
<tr>
<td>Vanadium</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Vinyl chloride</td>
<td>0.05</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>1,2-dichloroethane</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absorbable organic halogens</td>
<td>1</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Sulfides</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.1</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Zinc</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Benzene</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Nitrogen (total content)</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Phosphorus (total content)</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Cyanides,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total content</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free cyanides</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase in temperature</td>
<td>≤3°C</td>
<td>≤3°C</td>
<td>≤3°C</td>
</tr>
</tbody>
</table>

a. The wastewater temperature may not increase by more than 3°C at the boundary of wastewater mixing and dilution. If there is no wastewater mixing and dilution zone, it is necessary to use a distance of 100 m from the outlet point, provided that there are no sensitive ecosystems within this range of 100 m.

In the Russian Federation no technical norms (thresholds) have been established in relation to the concentration estimation of pollutant in air emissions / wastewater discharge from individual sources at industrial facilities.

The MPE/MPD of pollutants for each particular plant are calculated on the basis of approved normative documents: “Methodological procedure for calculation of concentrations of pollutants in atmospheric air as a result of air emissions from an industrial enterprise” and “Methodological guidelines for development of norms of permissible impact on water bodies” (approved by the RF MNR, No.328 of 12.12.2007).

These calculations should ensure reliable compliance with the Russian sanitary / fishery norms either at the boundary of a plant’s SPZ (for air emissions), or at a point of monitoring section in a watercourse downstream from the wastewater outlet of the plant.
OAO “TANECO” has already built its own wastewater outlet to the Kama River. Prior to being discharged into the river, the wastewater will undergo appropriate treatment at the Company’s treatment facilities.

In case wastewater is discharged into the municipal sewerage systems, the norms for release of chemical substances shall be set by the local administration. However, according to the wastewater removal flow chart adopted for the TANECO (including Stage 1), no wastewater will be discharged to municipal networks.

To assess the noise level caused by the operation of the TANECO Stage 1 facilities and affecting the adjacent residential zone, the regulatory maximum permissible noise levels established by the Russian legislation and contained in the relevant normative documents of international organizations were used, as presented in Table 1.5-5.

Table 1.5-5. Maximum permissible noise levels established by the national legislation of Russia and normative documents of international organizations

<table>
<thead>
<tr>
<th>Purpose of an area</th>
<th>Maximum permissible noise level, dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Russian norms</td>
</tr>
<tr>
<td>Residential zone</td>
<td>Day time: 55</td>
</tr>
<tr>
<td></td>
<td>Night time: 45</td>
</tr>
<tr>
<td></td>
<td>(indoors)</td>
</tr>
<tr>
<td>Commercial or industrial zone</td>
<td>Office buildings: 60</td>
</tr>
<tr>
<td></td>
<td>Production premises: 80</td>
</tr>
</tbody>
</table>

To assess the degree of soil contamination and the need for soil remediation, it is possible to use either the Russian norms or the Dutch List, which is used informally as a guidance document in many EU countries.

The Dutch List constitutes a set of criteria assessing soil contamination levels and provides guidance to take decision in relation to soil clean-up.

In the Russian Federation the requirements regarding permissible contents of pollutants in soils in residential areas are specified in the hygienic norm GN 2.1.7.2041-06 “Maximum Permissible Concentrations of Chemical Substances in Soils” (approved by the Chief State Sanitary Physician of the RF, Decrees Nos.1 and 2 of 23.01.2006).

In addition, the Sanitary Rules SanPiN 2.1.7.1287-03 “Sanitary epidemiological requirements to soil quality” provides the following classification categories of soils in residential areas depending on hazard for public health: clean, acceptable, moderately hazardous, hazardous and highly hazardous.

The above SanPiN and GN documents are applicable first of all for highly sensitive areas (zones of elevated risk): children’s and educational institutions, sports facilities, playing grounds within residential areas, recreational areas,
sanitary water protection zones of water bodies, coastal zones and sanitary protection zones.

To criteria for assessment of the level of soil contamination at industrial sites, which are applied in the Russian Federation, are set in the “Methodological Procedure for Evaluating Damage Caused by Soil and Land Deterioration” (approved in 1993).

According to this document, any damage caused as a result of soil contamination should be assessed based on the level of soil contamination, the size of contaminated land plots and several other parameters.

The level of soil contamination is characterized by five ranks: permissible (Level 1), slight (2), medium (3), high (4) and very high (5). The highest level begins when the degree of contamination exceeds five times the MPC values of contaminants concentrations. However, the need for land clean-up within an industrial site is not defined specifically in the RF regulatory documents. Baseline information on soil contamination in the area of the Project is presented in Section 2.3.6.

Table 1.5-6 shows the criteria of very high level of land contamination (if it is exceeded, the highest charge rate for soil contamination might be applied to the polluter) in accordance with the Russian norms and the intervention values according to the Dutch List.

<table>
<thead>
<tr>
<th>Contaminants</th>
<th>Criteria of highly severe land contamination (Russia) and intervention values set in the Dutch List for concentrations of contaminants in soil, mg/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Russian Norms</td>
</tr>
<tr>
<td>Total hydrocarbons</td>
<td>&gt; 5,000</td>
</tr>
<tr>
<td>Benzene</td>
<td>&gt; 10</td>
</tr>
<tr>
<td>Toluene</td>
<td>&gt; 100</td>
</tr>
<tr>
<td>Xylene</td>
<td>&gt; 100</td>
</tr>
</tbody>
</table>

In addition to the requirements and norms for air emissions, wastewater discharge and acoustic impact on the environment, there are also environmental aspects of best available techniques, in particular, for the oil refining and petrochemical industry.

The specific values for pollutants emissions to atmospheric air, wastewater and solid waste generation for the best available practices are given in Table 1.5-7.
<table>
<thead>
<tr>
<th>Description of parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>EHS Guidelines for Oil Refineries(^{14})</td>
<td></td>
</tr>
<tr>
<td>Land use</td>
<td>200-500 he</td>
</tr>
<tr>
<td>Total energy requirement</td>
<td>2100-2900 MJ/t of crude oil</td>
</tr>
<tr>
<td>Raw water requirement</td>
<td>0.07-0.14 m(^3)/t of crude oil</td>
</tr>
<tr>
<td>Wastewater quality</td>
<td>0.1-5 t/million of t of crude oil</td>
</tr>
<tr>
<td>Carbon dioxide emissions</td>
<td>25000-40000 t/million of t of crude oil</td>
</tr>
<tr>
<td>Nitrogen oxides emissions</td>
<td>90-450 t/million of t of crude oil</td>
</tr>
<tr>
<td>Particulate matter emissions</td>
<td>60-50 t/million of t of crude oil</td>
</tr>
<tr>
<td>Sulfur oxides emissions</td>
<td>60-300 t/million of t of crude oil</td>
</tr>
<tr>
<td>Emissions of volatile organic compounds (VOC)</td>
<td>120-300 t/million of t of crude oil</td>
</tr>
<tr>
<td>Solid waste generation</td>
<td>20-100 t/million of t of crude oil</td>
</tr>
<tr>
<td>EHS Guidelines for Production of Petroleum-containing Polymers(^{15})</td>
<td></td>
</tr>
<tr>
<td>Direct energy requirement</td>
<td>850-1500 kWh/t</td>
</tr>
<tr>
<td>Wastewater</td>
<td>0.6-25 m(^3)/t</td>
</tr>
<tr>
<td>VOC emissions</td>
<td>5 g/t</td>
</tr>
<tr>
<td>COD (COD emission)</td>
<td>2000-16000 g/t</td>
</tr>
<tr>
<td>Inert waste</td>
<td>0.8-18 kg/t</td>
</tr>
<tr>
<td>Hazardous waste</td>
<td>&lt; 0.45 kg/t</td>
</tr>
<tr>
<td>EHS Guidelines for Production of Petroleum-containing Chemicals(^{16})</td>
<td></td>
</tr>
<tr>
<td>Production of lower olefins:</td>
<td></td>
</tr>
<tr>
<td>Energy requirement (for ethane as feed)</td>
<td>15-25 GJ/t of ethylene</td>
</tr>
<tr>
<td>Energy requirement (for crude oil as feed)</td>
<td>25-40 GJ/t of ethylene</td>
</tr>
<tr>
<td>Alken emissions</td>
<td>40-50 GJ/t of ethylene</td>
</tr>
<tr>
<td>CO &amp; NOx emissions</td>
<td>2500 t/year</td>
</tr>
<tr>
<td>Sox emissions</td>
<td>200 t/year</td>
</tr>
<tr>
<td>VOC emissions</td>
<td>600 t/year</td>
</tr>
<tr>
<td>Wastewater generation</td>
<td>0.6-10 kg/t of ethylene</td>
</tr>
<tr>
<td>Total loss of hydrocarbons</td>
<td>15 m(^3)/hour</td>
</tr>
<tr>
<td>Production of aromatic hydrocarbons:</td>
<td></td>
</tr>
<tr>
<td>Steam requirement</td>
<td>0.3-0.5 % feed / 5-15 kg/t of ethylene</td>
</tr>
<tr>
<td>CO &amp; NOx emissions</td>
<td>0.5-1 kg/t of feed</td>
</tr>
<tr>
<td>Sox emissions</td>
<td>0-0.123 kg/t of feed</td>
</tr>
<tr>
<td>Solid waste generation</td>
<td>0-0.146 kg/t of feed</td>
</tr>
</tbody>
</table>

\(^{14}\) EHS Guidelines for oil refineries, 30 April 2007 (International Financial Corporation, World Bank Group)

\(^{15}\) EHS Guidelines for production of petroleum-containing polymers, 30 April 2007 (International Financial Corporation, World Bank Group)

\(^{16}\) EHS Guidelines for large-scale production of petroleum-containing organic chemicals, 2 March – 30 April 2007 (International Financial Corporation, World Bank Group)
### Table 1.5-7

<table>
<thead>
<tr>
<th>Description of parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production of volatile combustible substances (VCS):</td>
<td></td>
</tr>
<tr>
<td>Energy requirement</td>
<td>1.2-1.3 MWh/t of VCS</td>
</tr>
<tr>
<td>Liquid waste generation</td>
<td>25-40 kg/t of VCS</td>
</tr>
<tr>
<td>Oxygen catalyst</td>
<td>10-20 kg/t of VCS</td>
</tr>
<tr>
<td>Iron salts</td>
<td>10-50 kg/t of VCS</td>
</tr>
<tr>
<td>Coke</td>
<td>0.1-0.2 kg/t of VCS</td>
</tr>
</tbody>
</table>

It should be pointed out that the values of the parameters listed in Table 1.5-7 are only recommendations and comparative values, and they should be used for continuous improvement and achievement of “best” performance values.

### 1.6 ENVIRONMENTAL PERMITS AND APPROVALS FROM GOVERNMENTAL SUPERVISORY AGENCIES FOR PROJECT IMPLEMENTATION

The decision to develop the oil refining and petrochemical Complex was taken in 2005 by the Security Council of the Republic of Tatarstan (Resolution No.241 of 09.06.2005) and the Board of Directors of the “Tatneft” Oil Company (Orders No. 159 of 28.06.2005 and No.210 of 11.08.2005).

As a result of selection and consideration of three alternatives for the location of the Complex, an optimal site was selected. The land of the site initially was classified as forest land of Groups I and II (according to the RF Land Code) with areas of 36.4 ha and 275.1 ha, respectively. Later it was reclassified into land for industrial development in conformity with the official procedure on the basis of Resolution No.1199-r of 26.08.2006. Allocation of the land plot for construction of the TANECO Complex was approved by the Rospotrebnadzor.

Land allocation for the construction of the offsite facilities (i.e. motor roads for transportation of large-tonnage equipment, water pipeline, pipeline for treated wastewater, gas pipeline) was approved by the relevant territorial governmental agencies (Trans-Kama Territorial Department of the RT Ministry of Ecology and Natural Resources, Territorial Division of the State Property Management Department for the city of Nizhnekamsk and Nizhnekamsk District, Ministry of Agriculture of the Republic of Tatarstan, RT Department for Use of Subsoil Resources, etc.).

The general contractor responsible for the development of the Feasibility Study for Investment and the Stadiya Proekt for three Stages of the Oil Refining and Petrochemical Complex is the Russian engineering company OAO “VNIPI Neft”.

According to current Russian legislation the Feasibility Study for Investment is developed before the Stadiya Proekt and usually reviews and evaluates several alternatives of project implementation. The Stadiya Proekt provides detailed documentation for a single selected option. The Stadiya Proekt design documentation and materials should pass the state review (GlavGosExpertiza) obtain approvals from the relevant supervisory agencies.
The Feasibility Study for Investment for the TANECO Complex was prepared in 2006 and submitted to the relevant supervisory agencies. A positive statement and approvals were received from the following agencies: Rostekhnadzor, Rosprirodnadzor, Rosselkhoznadzor, Rospotrebnadzor, RosVodResources, and the RF Emergency Situations Ministry.

The materials of the Feasibility Study for Investment, including the infrastructure and transport facilities, also received a positive statement from the State Environmental Review Department.

The relevant government agencies issued a number of recommendations to be implemented during the subsequent phases of the project design development and implementation. Main recommendations were:

- The emissions from the Project facilities will contain some pollutants, for which no regulatory MPC levels are specified. It is required to conduct some research work to develop MPC values for $C_1$-$C_5$, $C_6$-$C_{10}$, as well as MPC values to replace the existing Safe Reference Levels of Impact for kerosene, methane, mineral petroleum oil, polypropylene dust, white corundum and talcum dust.

- It is necessary to make calculations of pollutants emissions taking into account the summation effect for emissions from the oil refinery in combination with the irritating and sensitizing impact of phthalate compounds.

- A review of sickness rates in the city of Nizhnekamsk is to be conducted in relation to nosologic units, as well as assessment of risks for public and occupational health in connection with impact of chemical factors on employees of the Nizhnekamsk Industrial Zone.

- A design of a network of monitoring wells is to be developed.

- Water bodies are to be protected against contamination.

- Provide funds for the improvement of the sanitary protection zone such as tree-planting and for waste disposal. TANECO has already spent about 26.36 million rubles for tree-planting for a total area 384.51 ha and is being made contracts for other SPZ improvements (forest protection and reproduction) for a total amount of 3.7 million rubles.

The above recommendations, aimed at complying with Russian environmental legislation and improvement of the design solutions, were taken into account in the course of further elaboration of project design materials.

The Company also fulfilled the procedure for public discussion of the project in conformity with the RF legislation. In accordance with the national requirements, public hearings were conducted in the city of Nizhnekamsk, access to the preliminary project materials was provided, and basic project design solutions with environmental protection measures were discussed with representatives of the local communities.

At the phase of preparation of the Feasibility Study for Investment, preliminary site selection documents were obtained and the procedure for reclassification of forest land to another land category implemented. The terms of reference for connection to utilities networks (gas, electricity, water, etc.) were obtained from the respective organizations.
At the *Stadiya Proekt* the following measures were taken, as requested by state agency during the review of the Feasibility Study for Investment:

1. The OAO “KNPU OrgnegtekhimZavod” Company developed a document specifying the maximum permissible air emissions (MPE document) for the existing enterprises of the Nizhnekamsk Industrial Zone and had it approved in 2007 by the RT Ministry of Ecology and Natural Resources and the RT Department of the *Rospotrebnadzor* Agency.

2. In 2008, the OAO “KNPU OrgnegtekhimZavod” Company developed a design of the united calculated sanitary protection zone for the enterprises of the Nizhnekamsk Industrial Zone with the objective of:
   - take into account the entire set of factors (air pollution, noise impact and other adverse impact factors);
   - define measures to ensure compliance with the sanitary and hygienic requirements for areas with permanent residence of local population;
   - assess the risks for public health due to exposure to a combination of factors in the course of the oil refinery operations and taking into account the future development of the entire industrial zone and commissioning of the new TANECO Complex.

The design of the united sanitary protection zone was approved in March 2008 by the *Rospotrebnadzor* Department for the Republic of Tatarstan and a statement was issued by the FGUZ “Center for Hygiene and Epidemiology of the RT” and the Federal Research Center of Hygiene named after F.F. Erisman (FNCG).

3. Currently, OAO “Nizhnekamsk Neftekhim” has concluded an agreement with the Russian State Medical University of the RF Ministry of Health for development of Safe Reference Levels of Impact for the following substances: mixture of olefins C_{2}-C_{28}, piperilene oligomers, ethylbenzene hydroxide, vinylacetilene, tetraethylglycol, piranic alcohol, methyl-tret-amile ether, ethyltrichloroacetate, metoxypropylamine, aminopropionitril.

4. In 2008 FGNU “State Research Institute of Lacustrine and River Fishery” (RT) evaluated the expected damage to fish resources of the Kama, Stepnoy Zai and Alanka Rivers and the Kama River bay as a result of construction and operation of the dispersive outlet for treated wastewater. The Kazan State University named after V.I. Ulyanov-Lenin computed in 2007 the expected damage to fish resources as a result of construction of an industrial water supply pipeline of the TANECO Complex and water supply for offsite facilities for minor watercourses (Alanka, Inysh, Martyshka and a nameless creek).

5. A network of monitoring wells has been developed during environmental monitoring program development.

Starting from January 01, 2006, some amendments to the RF Urban Planning Code came into force, which define the requirement to conduct only combined state review (*GlavGosExpertiza*) of design documentation (*Stadiya Proekt*) for construction and upgrade of facilities. This law has repealed the requirement
to conduct departmental and other types of review (environmental review, sanitary epidemiological review, etc.).

In 2008, OAO “VNIP Neft” completed preparation of the Stadiya Proekt for all three stages of the TANECO Oil refining and petrochemical Complex. The Stadiya Proekt was submitted to State review in accordance with the new requirement of the Urban Planning Code and the RF Government’s Decree No.145 of 05.03.2007 “Regulation on organization and procedure of State review (expertiza) of project design documentation and results of engineering surveys”. A negative statement was initially issued by GlavGosExpertiza of Russia (No.531-08/GGE-5607/02 of 18.08.2008) in connection with a number of comments and objections. After correction of the design documentation by OAO “TANECO” the Stadiya Proekt documentation was resubmitted to the review and received a positive statement of GlavGosExpertiza (No.621 – 08/GGE-5607/02, Reg. No. 00-1-4-3252-08, of 26.09.2008) for the project. This means that the project has successfully passed the state review procedure and a final approval was obtained from GlavGosExpertiza for the construction and operation of the TANECO oil refining and petrochemical complex. Moreover, GlavGosExpertiza recommended the implementation of the TANECO Oil Refining and Petrochemical Complex Project.

In September, 2008 the RT Executive committee of the Nizhnekamsk municipal district issued Permission for Construction of the TANECO Oil Refining and Petrochemical Complex.

Offsite Infrastructure Facilities

The Project was granted 16,5 billion rubbles (approx. USD 600 million) in June 2006 by the Investment Fund of the Federal Government for offsite infrastructure (pipelines and railway extension) to be built around the Complex.

In conformity with the investment agreement, RosEnergo shall organize and conduct construction and commissioning of the crude oil and petroleum product pipelines, RZhD is responsible for construction of the associated railroad transport facilities. The designs were developed for both pipelines and railroad transport facilities and included all mandatory environmental review materials required by the RF legislation. These designs were submitted for state review to GlavGosExpertiza.

The approval for construction of offsite infrastructure facilities required for the operation of the Complex was issued by GlavGosExpertiza in 2007.

1.7 PUBLIC RELATIONS AND INFORMATION DISCLOSURE DURING STAGE 1 IMPLEMENTATION

Actions to be taken within the framework of public consultations and information disclosure should comply with the requirements of:

- the Legislation of the Russian Federation;
• the Principles and procedures specified by the relevant international organizations, including EPFI, OECD and IFC.

1.7.1 Requirements of the National Legislation Relating to Participation of Citizens (Public Participation) in the Process of Decision Making

The RF legislation requires participation of citizens (public participation) in decision making on environmentally significant issues at all phases of the mandatory EIA according to the Russian legislation. Therefore TANECO has made a decision to conduct additional public consultation regarding both environmental and social issues of the Project, which will allow TANECO also to comply with IFI’s requirements.

Mechanisms for public participation are set forth in legislative and other regulatory and legal acts in accordance with the constitutional “right of any citizen for favorable environment, reliable information about the environment condition and compensation for any damage inflicted to health or property due to environmental delinquent acts”.

According to Article 11 of the Federal Law “On Environment Protection” (No.7-FZ of 10.01.2002 with amendments of 14.07.2008) any citizen has the right to:

- participate in meetings, demonstrations, picketing, collection of signatures under petitions, referendums on environmental issues and other actions, which do not violate the RF Legislation;
- make proposals relating to public environmental review of projects and participate in such review in accordance with the established procedure;
- address the state authorities of the Russian Federation, authorities of member territories of the Russian Federation, local self-government bodies and other organizations with complaints, applications and proposals relating to environmental issues, negative impacts on environment, etc. and obtain in due time substantiated replies;
- make claims in legal courts for compensation for damage to the environment.

Public associations (Article 12) have additional rights to:

- organize and conduct public hearings in accordance with the established procedure on issues of project planning, site location, commercial and other activities, which might affect the environment, pose threat to life, health and property of citizens;
- organize and conduct in accordance with the established procedure a public environmental review of projects;
- recommend their representatives for participation in state environmental reviews;
- apply to state authorities of the Russian Federation, authorities of member territories of the Russian Federation, local self-government bodies and legal courts with requests to cancel any decisions relating to project planning, site selection, construction, refurbishing,
operation of facilities, commercial and other activities, which might negatively affect the environment, as well as request to limit, suspend or terminate any commercial and other activities having negative impact on the environment.

At the phase preceding investments and during preparation for a construction project, the public is entitled to participate in the environmental impact assessment procedure. A regulation on environmental impact assessment of commercial and other activities in the Russian Federation was approved by a decree of the State Committee of Ecology of Russia on 16.05.2000 (Decree No.372). Section IV of the Regulation deals with disclosure of information for the public and public participation in the EIA procedure and emphasizes the following:

- Informing of the public and public participation at all phases of an environmental impact assessment;
- Public participation in preparation and discussion of EIA materials is to be ensured by the developer of the project as an integral part of the EIA process, and is to be organized by the local self-government bodies or corresponding state authorities with support from the developer and in accordance with the Russian legislation;
- Informing of the public and other participants of the EIA process at the phase of notification, preliminary assessment and definition of terms of reference for an EIA shall be ensured by the developer. Concise information about facilities to be reviewed at the federal level is to be announced in official publications of federal executive authorities;
- The developer accepts and documents any comments and proposals received from the general public during 30 days from the date of the information publication. The comments and proposals received are to be taken into consideration in the process of preparation of the terms of reference for the environmental impact assessment and should be reflected in the EIA materials;
- The developer should provide access for the interested public and other participants of the EIA process to the EIA terms of reference from the date of their approval and until the end of the EIA process;
- During the development of the EIA, an action plan is to be clarified for public discussions of the planned commercial activities, including reasonability of public hearings on EIA materials;
- The public hearings procedure is to be determined by the local self-government bodies with participation of the developer and support from the interested public. Any decisions relating to public participation should be properly documented;
- The developer should ensure public hearings on the planned activities with preparation of a protocol, in which it is to be clearly stated what issues are to be discussed and what is the issue of controversy between the public and the developer (if any). The protocol is to be signed by representatives of the executive authorities and local self-government bodies, citizens, public organizations.
(associations) and the developer. The public hearings protocol (brief minutes) are to be attached as one of the appendices to the final EIA materials.

Issues of organization and holding of an environmental referendum are regulated by the Federal Law “On Basic Guarantees of Voting Rights and Right for Participation in a Referendum of Citizens of the Russian Federation” (No.67-FZ of 12.06.2002) and the RT Law “On Local Referendum” (No.23-ZRT of 24.03.2004). According to the above laws:

- <...> Participants to a referendum are entitled to resolve within the framework of a local referendum any issue of local significance recognized as such in accordance with the statute of a given municipality <...> (Article 10 of the RT Law “On Local Referendum”);
- <...> To conduct a local referendum, obtaining of at least 5% signatures of the citizens entitled to organize in a referendum and supporting the initiative for its holding should be submitted to the representative local self-government body (Article 14, par.3 of the RT Law “On Local Referendum”);
- <...> A decision taken at a local referendum is binding and does not need any additional approval by any state authorities (officials) or local self-government bodies (Article 73, par.1 of the Federal Law “On Basic Guarantees …”);
- <...> If, for implementation of a decision made at a local referendum, it is required to enact a regulatory legal act, the local self-government body, to whose competence belongs for the given issue, is obliged to specify within 15 days after the decision comes into force the timeframe for preparation of such act <...> Article 73, par.9 of the Federal Law “On Basic Guarantees …”).

1.7.2 Principles and Procedures Adopted by IFI

International organizations pay significant attention to public involvement in the decision making process in relation to environmental and social issues for projects that they may support. A considerable contribution to approval of standards recognized at international level is made by the International Bank for Reconstruction and Development – the World Bank (and organizations of this Group, such as the International Financial Corporation). Serious attention is given to coordination of efforts of these institutions, which facilitates dissemination of common principles and procedures within the international arena.

The Equator Principles and OECD Recommendation on Common Approaches on the Environment and Officially Supported Export Credits contain general requirements to information disclosure on Projects rated as Category A. OECD Recommendation provides the specific timeframe for disclosure publicly project and environmental impact information. More detailed requirements are developed by IFC and are discussed below.
The IFC, which is a member of the World Bank Group, defined as early as in 1993 the requirement to conduct public consultations and ensure information disclosure as a condition for obtaining financing from this organization. Since then, the IFC has developed a number of additional guidelines and procedures specifying this requirement in more concrete terms. In December 1998 a special document was issued: the IFC Procedure for Environmental and Social Impact Assessment. This document sets forth the principles to be followed when preparing a consultation and information disclosure plan. In addition, in April 2006 an IFC Policy and Performance Standards for social and environmental sustainability were adopted.

In order to facilitate access to the disclosed information, the IFC circulates part of its information, mainly data relating to specific projects, through the information center InfoShop set up by the World Bank. Currently, the IFC ensures also support for an electronic mail box that receives comments of any interested parties about a specific project to the IFC management and officials. The materials offered for the general public on the website and containing a summary of project information or an environmental impact assessment of a particular IFC project provide also the pertaining information relating to the procedure for presentation of comments in electronic format.

By timely information disclosure within the framework of project documentation presentation, the IFC facilitates improvement of the reporting level, transparency and quality of decisions, as well as openness of the procedures. Project documentation disclosure facilitates also consultations at early phases of project implementation with local communities affected by a project.

**Public Consultations.** In conformity with the IFC Social and Environmental Sustainability Policy, efficient cooperation with the public is a basis for successful management of risks and impacts of projects on local communities within the zone affected by such projects. Through its Performance Standards, the IFC requires from its clients that they establish relations with local communities and disclose to them the pertaining information about a project, by holding consultations and ensuring public participation to an extent compatible with the risks and impacts for affected residents/communities.

Public involvement is a continuous process and includes disclosure of certain information by the client. In cases, when local residents may be exposed to risks and unfavorable impacts in the process of project implementation, the public involvement process foresees consultations with the residents potentially affected by the project. The purpose of public involvement is to establish and maintain constructive relations with the affected communities. The character and frequency of events associated with public involvement should be selected in accordance with the level of risks and adverse impacts on the communities associated with a given project. The public involvement process must be free of external manipulations, intervention, compulsion and intimidation; it should be supported by ensuring reliable and timely access to required information to be provided in a comprehensible form.
The main requirements for the Company in relation to public relations and information disclosure are set forth in IFC Performance Standard 1.

**IFC Performance Standard 1.** The paragraph of this Standard titled “Public Involvement” sets the following requirements:

1. **Information disclosure**
   - Presentation of a document containing the findings of a social and environmental assessment, if it had been conducted.
   - Provision of access for local residents (if they can be exposed to any risks or adverse impacts in the process of project implementation) to information related to the objectives, character and scale of a project, anticipated duration of the project implementation and associated risks/potential impacts for the affected communities.

2. **Consultations.** Effective consultations should be:
   - based on timely disclosure of required and adequate information, including project documents and plans;
   - started at an early phase of the social and environmental assessment process;
   - focused on identified risks and adverse impacts of social and environmental character, as well as proposed measures and actions for their prevention, minimization, mitigation or compensation;
   - conducted on a regular basis as long as risks and impacts are identified;
   - taken into consideration by the developer in the process of decision making: opinions of the affected communities with respect to the proposed mitigation measures, distribution of benefits and opportunities and various aspects of project implementation.

3. **Mechanism for consideration of complaints**
   - Development and realization of a mechanism for consideration of applications and complaints by affected residents relating to social and environmental aspects of the developer’s activities. Facilitation of settlement of identified problems (if the developer is not able to eliminate permanently existing risks or adverse impacts on the affected communities).

### 1.7.3 Public Consultations and Disclosure of Project Information

The Company fulfilled the procedure for public discussions of the Project and EIA required by the Russian Federation’s legislation. Starting in 2006 public hearings were conducted in the city of Nizhnekamsk, access to the preliminary project materials was provided for the public, and the Project design together with the environmental protection measures were discussed with the representatives of affected local communities.

The Company organized regular disclosure of information to the public and stakeholders. Over 30 publications on the Project were published in regional newspapers in 2005-2008.
At the same time, the Company recognizes the need for continuation of the public relations’ activities and disclosure of the Project information, in compliance with the IFI’s environmental and social requirements. Requirements in relation to disclosure of project information are defined in a general form in the Equator Principles and are specified in a number of internationally recognized standards, as follows:

- Identification and review of all interested parties (stakeholders);
- Involvement of all interested parties in the process of consultations and information disclosure;
- Timely submission of the required information to all interested parties;
- Existence of grievance mechanism (reception and consideration of complaints and proposals from external interested parties and the Company’s own employees).

In order to comply with the above requirements, a draft of the Public Consultation and Disclosure Plan (PCDP) has been prepared by ERM for all phases of the Oil Refinery development and implementation. The plan includes discussion of the feasibility study materials and the ESIA before the start of construction, as well as regular consultations with the public during the Oil Refinery’s construction and operation phases.

Implementation of this Plan by TANECO will ensure full compliance with the Equator Principles with regard to public awareness and disclosure of the Project information.

1.8 Requirements of Potential Investors / Lenders and Insurers

The financial consultants for the Projects are the Zenit Bank and the BNP Paribas Bank as an international consultant. CJSC “March-Insurance Brokers” has been selected as an international insurance consultant. A consortium consisting of JSC “National Insurance Group” (Moscow) and CJSC “Chulpan Insurance Company” (Almetyevsk) were selected as insurers. The insurance companies did not set any additional environmental and social requirements for the Project.

In 2007 a loan agreement for an amount of US $2 billion was concluded with a syndicate of international banks.

Additional funding from international financing institutions and banks may be required to fund the Project construction. In this connection the Project may need to comply with their environmental and social requirements which include the EP and the OECD/IFC/WB requirements.

The Sponsor and TANECO have anticipated such possible request from IFI and have therefore decided that the Project will comply with the EP/OECD/IFC/WB requirements and have appointed ERM to assist them in the preparation of ESIA and other documents to meet these requirements.

The policy of the leading financial institutions/banks that adopted the EP requires that the Project shall be EP compliant in case it is financed on a Project Financing basis or may require the EP compliance of a Project although...
it is not financed on a Project Financing basis. In these cases, the following requirements should be taken into consideration:

- The Equator Principles adopted in July 2006 by a group of major financial institutions and based on the policy and guidelines of the International Financial Corporation;
- Revised Council Recommendation on Common Approaches on the Environment and Officially Supported Credits, June 12, 2007;
- IFC Performance Standards 1-8 relating to environmental, health, safety and social issues (revision of April 2006).

For projects rated Category A (potentially highly hazardous in environmental respect) under the EP, – as this is the case for the Project -, it is necessary to conduct an Environmental and Social Impact Assessment.

This present ESIA document along with its associated ESMP was developed in this respect and it will be reviewed by international financial institutions and possibly by an independent environmental consultant appointed on their behalf.

Based on the results of the review, a decision is to be taken whether the given investment project complies with the environmental principles of the given financial institution and whether the environmental and social risks associated with financing of a particular investment project are acceptable.
2 BASELINE CONDITIONS IN THE AREA TO BE POTENTIALLY AFFECTED BY CONSTRUCTION AND OPERATION OF STAGE 1

2.1 CURRENT LAND USE IN THE AREA FOR PROJECT IMPLEMENTATION

The site for the TANECO Complex construction is located within compartments 85, 86, 95, 96 and 97 of the Biklyanskoye division of the Nizhnekamsk Forestry Department within the Nizhnekamsk Industrial Zone. The layout plan of the Complex is shown in Figure 2.1-1.

The site is located to the south of the railroad track of the Station of Biklyan (Kuybyshev Railroad Department) at the track section Biklyan – Sobolevo.

To the west of the site there are some agroindustrial facilities and construction industry facilities at a distance of over 4 km and a gas condensate plant at a distance of 200m.

To the east of the site, there are sludge disposal areas of the cogeneration plants TEC-2 and Nizhnekamsk TEC-2, as well as an electric substation (220/110 kV) and the railroad station of Biklyan.

To the north-east, a tire manufacturing plant (AO “Nizhnekamsk Shina”) and the Nizhnekamsk plant for technical-grade carbon manufacture are located.

To the south, the site borders an existing landfill for industrial waste disposal and an ethylene trunk pipeline.

To the north of the site, the highway Bugulma – Naberezhnye Chelny, an aboveground heating pipeline and the OAO “Nizhnekamskneftekhim” tramway line run along the site.

Residential areas of the city of Nizhnekamsk are situated to the north-west of the site at a distance of 5km from the site border of the future TANECO Complex.

The nearest residential areas are located at the following distances:

- to the north: village of Prosti (4,500m);
- to the south: village of Ishteryakovo (3,650m);
- to the south-east: settlement of Martysh (1,550m), settlement of Avlash (4,250m) and village of Nikoshnovka (4,500m);
- to the south-west: orchards of the settlement of Balchykly (4,000m), the settlement of Balchykly itself (5,500m) and the village of Klyatle (4,200m);
- to the west: orchards of the settlement of Stroiteley (2,250m);
- to the west and north-west: village of Alan (1,300m) and residential districts of the city of Nizhnekamsk (5,000m).

The total population of the residential areas mentioned above is in the range of 7,000 people.
2.2  **ENVIRONMENTAL AND ASSOCIATED CONSTRAINTS RELATING TO THE AREA FOR THE STAGE 1 IMPLEMENTATION**

The term of environmental and associated constraints of project implementation refers to:
- Environmental constraints with respect to industrial activity impacts on natural protected areas;
- Compliance with regulatory norms in relation to quality of environment and living conditions in residential areas affected by industrial activity.

Consideration of environmental limitations is an essential criterion for sustainable operation of the planned Oil Refinery.

This section of the Environmental and Social Impact Assessment Report contains description of environment protection, nature conservation and other measures associated with the project implementation under specific environmental conditions of the selected site for the Project.

2.2.1  **Water Bodies**

Water of potable quality for the water supply network of the city of Nizhnekamsk is abstracted from the Nizhnekamsk (Lower Kama) water reservoir and from underground aquifers. A number of industrial enterprises in the city have their own artesian wells. Part of the population use water from water springs. The Project construction site is located outside of the sanitary protection zone of fresh water abstraction facilities. The project will not affect the drinking water supply for the city.

The Kama River (watercourse of Fishery Category 1) flows at a distance of 6 km to the north of the industrial zone and 10 km from the construction site. The minimum width of the water protection zone is 200 m in accordance with the requirements of the RF Water Code (No.74 of 03.06.2006, Revision of 14.07.2008).

The Oil Refinery design provides for the construction of the following facilities:
- A loading dock chamber on the left-hand bank of the Kama River (the so called Old Kama or Afanasyevskaya Volozhka) located in the Kama reach of the Kuybyshevsky reservoir;
- A Sewer line for treated wastewater with a dispersion outlet to the Kama River.

The planned TANECO facilities can have a potential negative impact on the fishery conditions in the Kuybyshevsky water reservoir (Kama River) as a result of release of treated wastewater, which after treatment are discharged to an accumulating pond and then pumped to an outlet to the Kama River at a distance of 22 km from the city of Nizhnekamsk, as well as during the construction and operation of a loading dock chamber.

Taking into account that treated wastewater will be released directly to the Kama River it is necessary to comply with the requirements for the level of
wastewater treatment. Detailed discussion of potential impacts on surface water bodies is presented in Section 5.3.1.

2.2.2 **Air Quality in the Area of the Nizhnekamsk Industrial Zone**

The Oil Refinery will be built in an area with current level of substantial atmospheric air pollution.

The main air pollution sources in the area of the site selected for construction of the TANECO facilities are petrochemical plants (OAO “NizhnekamskNeftekhim”, OAO “NizhnekamskShina”, Nizhnekamsk plant manufacturing technical-grade carbon products, OAO “TAIF-NK”), co-generation plants (TEC-1, TEC-2) and transport.

The level of concentration of main pollutants in the air currently complies with the Russian regulatory hygienic norms. However the concentrations of phenol exceed the regulatory limit for permissible ground-level instantaneous concentrations and the reported average annual level of formaldehyde concentrations reached 0.008 mg/m$^3$ (2.67 MPC). The level of air pollution is rated as ‘elevated’.

The construction and operation of the new facilities might cause an increase in the emissions of pollutants from the industrial zone, unless appropriate air pollution mitigation measures are taken.

In this connection a number of measures have been elaborated to reduce gross emissions of pollutants by 20,000 t/year from the enterprises located in the Nizhnekamsk Industrial Zone to eliminate any additional environmental impact (see Section 5.1 “Impact on Atmospheric Air Quality”). The planned air pollution mitigation measures were approved by the Cabinet of Ministers of the Republic of Tatarstan.

2.2.3 **Sanitary Protection Zone of the TANECO Complex**

According to par.2.17 of the SanPiN Norm 2.2.1/2.1.1.1200-03 “Sanitary Protection Zones and Sanitary Classification of Industrial Enterprises, Installations and Facilities”, a common SPZ is established for the Nizhnekamsk Industrial Zone as an integrated whole and the dimensions of a regulatory SPZ for each enterprise is considered only as a guideline.

Upon an initiative of OAO “TANECO” a preliminary design of the United Sanitary Protection Zone for the enterprises of the Nizhnekamsk Industrial Zone, including the new TANECO Complex (all three Stages), was developed (see Figure 2.2-1).

The final dimensions of the USPZ will be determined based on the results of the air and noise monitoring after commissioning of the TANECO Stage 1 facilities.

The settlement of Martysh and the village of Alan are situated within this preliminary USPZ.

According to par.2.30 of SanPiN 2.2.1/2.1.1.1200-03 and the pollution dispersion calculations included in the SPZ Design, it was proposed that the
residents of Martysh and Alan be resettled outside of the SPZ before the commissioning of the new TANECO Complex (Letter of 02.07.2008 by the local Rospotrebnadzor division to the RT Department of Rospotrebnadzor).

As the USPZ was determined taking into account operation of all three Stages, the issue on possible resettlement will be reconsidered based on the current focus on the development of the Oil Refinery (instead of the whole Complex).

The final decision on potential resettlement will be made based on the environmental monitoring results after the Stage 1 facilities commissioning.

In August 2008, the RT Cabinet of Ministers sent upon an initiative of TANECO a letter addressed to the respective municipality administration and governmental authorities of the Republic of Tatarstan requiring to suspend the procedures for registration of citizens, allocation of land plots, cadastre registration of land plots and immobile property with the purpose of their purchase and sale in the above residential areas.

The issue of possible resettlement of these two settlements is further discussed in Section 5.10.

2.2.4 *Specially Protected Areas*

A part of the National Park ‘Lower Kama’ is located within the Nizhnekamsk District.

As the national park is not located in the USPZ of the Nizhnekamsk Industrial Zone and is at a significant distance (aprox. 10km) from the construction site of the TANECO complex, the latter will have no impact or will have only insignificant impact on the national park.

Any other protected areas in Nizhnekamsk District are situated at a large distance from the industrial zone and are not exposed to any direct or indirect impact.

There are no national parks or natural monuments within the area potentially affected by Stage 1 and the envisaged TANECO complex.

2.2.5 *Vegetation and Wildlife*

No protected, rare or endangered plant species included in the RT, RF and IUCN Red Lists and no rare plant associations have been identified in the course of the assessment made in connection with the Stage 1 construction project. There are no habitat areas of protected, rare or endangered animal species within the area potentially affected by the Oil Refinery.

2.2.6 *Migration Ways and Areas of Accumulation of Birds*

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17 A Natural Monument is a natural/cultural feature of outstanding or unique value because of its inherent rarity, representative of aesthetic qualities or cultural significance.
Individual birds of migrating bird species were reported as a result of visual observations in the area of settling ponds and sludge accumulating ponds within the given industrial zone.

### 2.2.7 Fishery Water Bodies

The Kuybishevskoye Water Reservoir (Kama River) is rated as the highest and the first fishery category. In the process of the design development for the outlet of treated wastewater from Stage 1 and in the course of construction and operation of the dock chamber, it is necessary to take into consideration the requirements set for the wastewater composition and those set for any commercial activities carried out within the water protection zone.

### 2.2.8 Recreational Areas

The National Park ‘Lower Kama’, the nature memorial of regional significance ‘Borkovskaya Dacha’ and forests of the Nizhnekamsk, Zainsky, Sarmanovsky and Aznakaevsky Forestry Departments have among other things also recreational functions. These areas are located at a distance of more than 10 km from the Complex and the planned TANECO facilities will have, therefore, no adverse impact or only insignificant impact.

### 2.2.9 Historic and Cultural Sites

According to a statement made by the Main Department for governmental supervision over protection and use of historic and cultural sites, no archeological sites were identified within the Project construction zone.

### 2.3 General Characteristics of the Environment in the Area of Project Implementation

#### 2.3.1 Climate

The climate in Nizhnekamsk District is moderately continental, with typical variations of ambient air temperatures in winter and with fast increase of temperatures in spring. The average annual ambient air temperature is +3.4°C. The average maximum temperature of the warmest month is +25.5°C and the lowest temperature of the coldest month is –17.2°C. The absolute maximum temperature ever recorded is +40°C and the absolute minimum temperature is –47°C. The average annual precipitation rate is 541.3 mm, of which two thirds are recorded during the warm period of a year. The lowest precipitation rate in the district is recorded in its south-eastern part, and the highest precipitation rate is recorded in the north-western part of the district. In general, the
precipitation rate increases in the direction from south-east to north-west. The sum of precipitation during the warm period of a year increases from south-west toward north-east and varies from 333mm to 356mm. The sums of precipitation of the cold and warm periods of a year have averaged during the recent 3 years 166.4 mm and 389mm, respectively, in Yelabuga and 169 mm and 364.1 mm in Begishevo.

The direction of prevailing winds recorded at both weather stations is southerly and south-westerly.

The duration of a period with temperatures above freezing point is approximately 135 days and a period with temperatures above +10°C is 142 days.

Frosts cease to occur during the second ten days of May and start during the second ten days of October. The number of days with snow cover is 153 days. The maximum and minimum snow cover depth (42 cm and 36 cm) was recorded in the northern and southern parts of the district, respectively. The distribution of water reserves in snow cover is similar and increases from 77 mm in the south up to 112 mm in the north of the district.

2.3.2 Air Quality

Emissions of pollutants to the atmosphere from stationary emission sources recorded in the city of Nizhnekamsk in 2006 amounted to about 96,000 t/year, an increase by 22,800 t in comparison with the previous year (2005). The main air polluters in Nizhnekamsk District are the industrial enterprises in the city of Nizhnekamsk (97% to 98% of the total air emissions): OAO “NizhnekamskNeftekhim”, OOO “NizhnekamskNeftekhim-Divinyl”, ZAO “TAIF-NK”.

The atmospheric air quality in the city is affected mainly by emissions of the following pollutants: sulfur dioxide, nitrogen dioxide, dust, hydrogen sulfide, benz(a)pyrene, formaldehyde and phenol.

In 2006, dispersion of pollutants released from the enterprises of the Nizhnekamsk Industrial Zone within the ground-level layer of the atmosphere was calculated on the basis of the emission source parameters indicated in the document specifying the maximum permissible air emissions (MPE document) for the Nizhnekamsk Industrial Zone.

It was found that 275 pollutants are released to the atmosphere, including:

- Pollutants of Class 1 (extremely hazardous) 13
- Pollutants of Class 2 (very hazardous) 42
- Pollutants of Class 3 (hazardous) 56
- Pollutants of Class 4 (moderately hazardous) 34
- Pollutants without hazard class 130

The total amount of pollutants released annually to the atmosphere is 95,922.29008 t, including:

- Pollutants of Class 1 87,427.46 t/year
- Pollutants of Class 2 1,523.89533 t/year
In order to assess the impact of pollutants emissions to the atmosphere from the emission sources of the Nizhnekamsk Industrial Zone, some points were selected in the residential districts of the city of Nizhnekamsk located to the north-west from the construction site, as well as in residential areas located within a range of 5 km around the construction site.

The list of priority pollutants affecting the air quality in the area around the Nizhnekamsk Industrial Zone according to the field measurements performed by FGUZ “Center of Hygiene and Epidemiology in the Republic of Tatarstan” in 2007 includes the following pollutants: nitrogen dioxide, hydrosulfide, hydrocarbons, particulate matters, formaldehyde, phenol, carbon monoxide, sulfur dioxide and ammonia.

Table 2.3-1 contains the overall characteristics of atmospheric air pollution with priority pollutants.

**Table 2.3-1. Characteristics of atmospheric air pollution in the construction site area according to the available data of GU “UGMS of Republic of Tatarstan” of 2007**

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>MPC (average daily)</th>
<th>( C_{avr} )</th>
<th>( C_{avr}/MPC )</th>
<th>( C_{max} )</th>
<th>( C_{max}/MPC )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulate matter</td>
<td>0.150</td>
<td>0.100</td>
<td>0.67</td>
<td>0.500</td>
<td>0.200</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>0.050</td>
<td>0.003</td>
<td>0.06</td>
<td>0.500</td>
<td>0.022</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>3.00</td>
<td>0.700</td>
<td>0.20</td>
<td>5.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>0.040</td>
<td>0.020</td>
<td>0.45</td>
<td>0.200</td>
<td>0.100</td>
</tr>
<tr>
<td>Hydrosulfide</td>
<td>-</td>
<td>0.001</td>
<td>-</td>
<td>0.008</td>
<td>0.007</td>
</tr>
<tr>
<td>Phenol</td>
<td>0.003</td>
<td>0.002</td>
<td>0.67</td>
<td>0.010</td>
<td>0.013</td>
</tr>
<tr>
<td>Ammonia</td>
<td>0.040</td>
<td>0.010</td>
<td>0.25</td>
<td>0.200</td>
<td>0.020</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>0.003</td>
<td>0.008</td>
<td>2.67</td>
<td>0.035</td>
<td>0.027</td>
</tr>
<tr>
<td>Hydrocarbons C(<em>1)–C(</em>{10})</td>
<td>-</td>
<td>1.980</td>
<td>-</td>
<td>50.0</td>
<td>5.000</td>
</tr>
</tbody>
</table>

The baseline concentrations calculated for each pollutant in accordance with the Guidelines RD 52.04.186-89 as statistically reliable maximum instantaneous concentrations, the values of which are exceeded in 5% of cases (in-situ measurements), characterize the atmospheric air pollution caused by other emission sources in the areas adjacent to the TANECO Complex site. The values of the baseline concentrations are given in Table 2.3-2.
Table 2.3-2. Baseline concentrations, proportion of MPC (max instantaneous values)

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>MPC_{max,instaneous}</th>
<th>Calms</th>
<th>Wind direction at V &gt; 2 m/s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Particulate matter</td>
<td>0.500</td>
<td>0.423</td>
<td>0.334</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>0.500</td>
<td>0.013</td>
<td>0.013</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>5.000</td>
<td>0.396</td>
<td>0.463</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>0.200</td>
<td>0.340</td>
<td>0.300</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>0.008</td>
<td>0.656</td>
<td>0.514</td>
</tr>
<tr>
<td>Phenol</td>
<td>0.010</td>
<td>0.691</td>
<td>0.637</td>
</tr>
<tr>
<td>Ammonia</td>
<td>0.200</td>
<td>0.318</td>
<td>0.158</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>0.035</td>
<td>1.011</td>
<td>0.801</td>
</tr>
<tr>
<td>Hydrocarbons C₁ – C₁₀</td>
<td>50.000</td>
<td>0.091</td>
<td>0.121</td>
</tr>
</tbody>
</table>

The sum of concentrations of pollutants having a summation effect exceeds the unity virtually for all possible summation groups.

The total number of air emission sources in the Nizhnekamsk Industrial Zone, including point and fugitive emission sources equipped with gas treatment and dust recovery devices releasing pollutants to the atmosphere is 3,491. In the future, i.e. after the TANECO Stage 1 facilities commissioning their number will increase up to 3,694.

In 2006 the RT Cabinet of Ministers issued a decree, according to which the total emissions from the enterprises in the Nizhnekamsk Industrial Zone are to be reduced by 20,000 t by 2010 and a specific amount of emission reduction is approved for each industrial enterprise.

The amounts of emission reductions for individual enterprises in the Nizhnekamsk Industrial Zone are given in Table 2.3-3.

Table 2.3-3 Emission reductions to be achieved by individual enterprises in the Nizhnekamsk Industrial Zone

<table>
<thead>
<tr>
<th>Enterprise</th>
<th>Emission reduction. t/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon monoxide</td>
<td></td>
</tr>
<tr>
<td>OAO «Nizhnekamsk Neftekhim»</td>
<td>1,880,000</td>
</tr>
<tr>
<td>OAO «Neftekhim-Divinyl»</td>
<td>942.600</td>
</tr>
<tr>
<td>OAO «Nizhnekamsk TEC»</td>
<td>191.400</td>
</tr>
<tr>
<td>ZAO «TAIF-NK»</td>
<td>30,500</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>3,044,500</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td></td>
</tr>
<tr>
<td>OAO «Nizhnekamsk Neftekhim»</td>
<td>1,518,519</td>
</tr>
<tr>
<td>OAO «Nizhnekamsk TEC»</td>
<td>1,101,600</td>
</tr>
<tr>
<td>ZAO «TAIF-NK»</td>
<td>18,800</td>
</tr>
<tr>
<td>Enterprise</td>
<td>Emission reduction, t/year</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td><strong>Subtotal:</strong></td>
<td>2,638.919</td>
</tr>
<tr>
<td><strong>Sulfur dioxide</strong></td>
<td></td>
</tr>
<tr>
<td>ZAO «TAIF-NK»</td>
<td>16.050</td>
</tr>
<tr>
<td>OAO «Nizhnekamsk TEC»</td>
<td>40.250</td>
</tr>
<tr>
<td>OAO «Nizhnekamsk TehUglerod»</td>
<td>15.240</td>
</tr>
<tr>
<td><strong>Subtotal:</strong></td>
<td>71.540</td>
</tr>
<tr>
<td><strong>Hydrogen sulfide</strong></td>
<td></td>
</tr>
<tr>
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### 2.3.3 Hydrology and Surface Water Bodies; Quality of Surface Waters

**Surface Water Bodies**

Watercourses in this district belong to the basin of the Kama River, the main transit watercourse of the region. The main draining watercourse is the Zai River; secondary watercourses are the Uratma, Sheshma and Osha rivers. The total length of all rivers is 300 km; the density of the river network is 0.19 km/km². The difference in elevations between the head and mouth of rivers is approximately 200m. All rivers are of lowland river type. The flow direction from north to south reflects the major structural elements of the Volga-Ural dome.

The main portion of the river discharge is recorded during spring floods. During the summer/autumn low-water period, the rivers are fed by atmospheric precipitation and underground water inflow. In winter feeding is only by underground water. The average annual discharge of the Zai River is 7 m³/sec.

The temperature conditions of the rivers (with an exception of the Kama River) correspond to the ambient air temperature conditions.

Freezing of minor watercourses starts in the first half of November and the Kama River starts freezing in the second half of November.

The chemical composition of water is characterized by hydrocarbonate-chloride-calcium mineralization, which is attributed to abundant limestone/marl and dolomite inclusions in the rocks of the Permian series.

The carbonate hardness of river water is as high as 16-17° and the total hardness is 17-25°.

Water of potable quality is supplied to the city of Nizhnekamsk from the Lower Kama Water Reservoir via the water abstraction facility “Belous” of the city of Naberezhnye Chelny and technical water is abstracted by OAO “NizhnekamskNeftekhim” from the Kama River.

Currently, there are two operating water abstraction facilities: in the settlements of Kamskiye Polyany and Krasnyi Klyuch; they are operated by OOO “Vodokanal” and OAO “NizhnekamskNeftekhim”, respectively.

In addition, some industrial enterprises in the city have their own artesian wells. A part of the city residents take water from water springs.

The nearest surface water bodies in the vicinity of the industrial zone are the Alanka, Tunguchu, Avlashka and Strelochny Log rivers.

**Surface water contamination**
According to the data from the technical report “Laboratory investigations of atmospheric air, soils and water from water bodies and underground water sources in the sanitary protection zone of the Nizhnekamsk Industrial Zone” prepared by FGUZ “Center of Hygiene and Epidemiology in the Republic of Tatarstan” (Kazan, 2007), water in the Kama River does not meet the requirements set for fishery water bodies with respect to concentrations of iron, copper, aluminium, petroleum hydrocarbons and phenols as well as with respect to biological oxygen demand (BOD).

Water in the Avlashka River (a minor watercourse) does not comply with the regulatory requirements in relation to contents of sulfates, ammonium nitrogen, nitrates, phosphates, iron, copper, aluminium, phenols, petroleum hydrocarbons and BOD.

Water in the Strelochny Log River does not meet the regulatory norms in relation to concentrations of sulfates, BOD5, nitrates, iron, copper, phenols, petroleum hydrocarbons and aluminium. The most likely cause of the water contamination is pollution of man-made origin.

There are some settling ponds on the Tungucha River used by OAO “NizhnekamskNeftekhim”. They are designed for the treatment of storm water and snow-melt water runoff from the Company’s site and of the flushing water from the water cooling tower.

The Strelochny Log River is located to the west of the industrial zone. A buffer pond is located at the river. This pond is used for collection and removal of mechanical impurities from assumable clean runoff from the sites situated within the fenced north-western part of the industrial zone and effluents from the water pretreatment plant (settlers, filters, tanks). Treated wastewater not used in the water recycling system of the sites mentioned above will be released to the Strelochny Log River and further to the Kama River.

The Kama River receives also wastewater from OAO “NizhnekamskNeftekhim” facilities.

The Alanka River in its upper reaches is not in satisfactory condition either. Even according to the incomplete data available, it is contaminated with biogenic substances.

The BOD5 value and concentrations of ammonium nitrogen and phenol have exceeded the regulatory limits on a regular basis during the past years (by a factor of 1.1 to 2.0). During some periods the pollutants concentrations exceeded the regulatory limits for phenol by 8 times, ammonium nitrogen by 3.4 times, BOD, COD, sulfates and dry residue by 1.1 to 1.7 times.

Quality of Surface and Underground Waters within the United SPZ of the Nizhnekamsk Industrial Zone

According to the technical report “Laboratory investigations of atmospheric air, soils and water from water bodies and underground water sources in the sanitary protection zone of the Nizhnekamsk Industrial Zone” prepared by FGUZ “Center of Hygiene and Epidemiology in the Republic of Tatarstan” (Kazan, 2007), the quality of surface and underground waters within the USPZ only partially complies with the relevant sanitary and hygienic requirements. Analyses of the water from the pond at the village of Prosti indicate that all 10 samples do not comply with the hygienic norms with respect to
concentrations of ammonia, iron, polyphosphates and COD, i.e. 15.4% of the total number of pollutants to be determined.

Analyses of water samples from the artesian wells at the TEC-2 co-generation plant indicate that 8 of 10 samples investigated do not comply with the hygienic norms in relation to organoleptic indicators (odor, turbidity, color), i.e. 11.5% of the total number of parameters to be determined.

All analyzed water samples from the artesian wells of OAO “NizhnekamskNeftekhim” (wells ZGSh and ZMSh) complied with the hygienic requirements.

The analyses of water from the Kama River (Korabelnaya Roshcha beach, Old Kama) have shown that out of 18 samples one sample does not comply with the norms in relation to iron (2 MPC), which is 3.8% of the total number of parameters to be monitored.

Water sampling and analysis of water from surface water bodies and underground water sources located outside of the SPZ complied with the sanitary and hygienic norms SanPiN 2.1.4.1074-01 “Potable Water. Hygienic Requirements to Water Quality in Centralized Potable Water Supply System. Quality Control” and SanPiN 2.1.5.980-00 “Hygienic Requirements to Surface Water Protection”.

Analyses of water from the artesian well NLVZ indicated that three of ten investigated samples did not meet the hygienic requirements in relation to total hardness; one sample did not comply with the organoleptic requirements (turbidity), which is 10.5% of the total number of parameters to be monitored.

All investigated water samples from the Pionerskoye Lake complied with the hygienic requirements.

The investigated water samples from the water spring in the Chabyinskaya Street complied with the SanPiN Norm 2.1.4.1074-01 “Potable Water. Hygienic Requirements to Water Quality in Centralized Potable Water Supply System. Quality Control” and SanPiN 2.1.5.980-00 “Hygienic Requirements to Surface Water Protection”.

The investigated water samples from the water spring in the Lesnaya Street (Nizhnekamsk) complied in relation to chemical indicators with the SanPiN Norm 2.1.4.1074-01 “Potable Water. Hygienic Requirements to Water Quality in Centralized Potable Water Supply System. Quality Control” and SanPiN 2.1.5.980-00 “Hygienic Requirements to Surface Water Protection”, except for hardness indicates (total hardness 5.54 to 12.4), which is 2.9% of the total number of parameters to be monitored.

Analyses of drinking water from shallow wells in the village of Klyatle indicated that out of 8 investigated samples two samples did not meet the hygienic requirements in relation to total hardness (7.8 to 8.54), which is 5.3% of the total number of parameters to be monitored.

### 2.3.4 Hydrogeological Conditions

Underground waters within the area are associated with the Upper Permian eluvial fissured sandstones and clays, as well as with Quaternary eluvial-deluvial deposits consisting of sandy silts, clays and in rare cases dust-like
sands. Steady underground water levels were recorded at depths of 1.05m to 8.02m, absolute elevations 183.03 m to 198.38 m.

With respect to their hydraulic properties, underground waters form the uppermost unconfined water-bearing horizon of infiltration origin with a free level.

The maximum underground water level is reported during the snow-melting period in spring (April-May) and the minimum level is recorded in winter (December-March).

The aquifuge layer is composed of Upper Permian clays free of any through-fissures.

Potential saturation of the ground at the site may be caused mainly by underground waters.

In the process of construction and operation of the planned facilities, it might be possible that the soils in the upper part of the cross-section be saturated with water due to occurrence of irregular shallow temporary water (verkhovodka), because construction of roads and underground networks, excavation of pits and trenches, leaks from the networks, etc. will enhance water infiltration through the ground.

An indication for verkhovodka occurrence is tough- and soft-plastic sandy silts in the upper portions of the cross-section. In the future, verkhovodka would cover new areas of the site, affect the engineering geological properties of soils and form a continuous water-bearing horizon of man-made origin.

According to the results of standard chemical analyses of underground water samples, underground water under its natural conditions is slightly corrosive with respect to concrete. With respect to its chemical composition, underground water has a hydrocarbonate-calcium mineralization of 0.535 g/l.

2.3.5 Geological Setting

Geomorphology and Topography

In relation to its geomorphological conditions, the site is associated with the catchment area of the Kama and Zai Rivers, and crossed with a nameless creek, which is a right-hand tributary of the Avlazhka River, which is in turn a right-hand tributary of the Zycha River. The surface relief of the site is relatively even, with a gentle eastward slope toward the nameless creek, with a difference of absolute elevations within 205.0m to 190.0m.

The surface runoff (storm water and snow-melt water) drains from most of the site, with an exception of the northern, north-western and north-eastern parts of the site, where the surface relief is disturbed by roadbeds causing stagnation of storm water and snow-melt water, although no swamping of the ground has been observed.

There is no hydrographic network directly within the site selected for the construction of Stage 1. The Kama River runs to the north and west of the site at a distance of 10km to 15km.
No hazardous physical geological processes and phenomena (erosion, land slides, suffosion, karsts, etc.) have been reported, which could have a negative impact on the stability of shallow and deep soil masses.

Out of the existing unfavorable factors the following can be pointed out:

- Presence of Upper Permian eluvial non-uniform weathered rocks in the western and south-western parts of the site;
- Low bearing capacity of the ground;
- Periodic occurrence of irregular shallow temporary water (verkhovodka) in the upper portion of the cross-section;
- Saturation of the soil in some parts of the site with underground water.

Engineering geological conditions

The geological lithological structure of the site within the depth exposed by drill-holes is composed of Quaternary eluvial-deluvial (edQ_{I-II}) deposits overlying the Upper Permian eluvial deposits (еP_{2t}) in a stratigraphically non-conforming manner and overlaid by the surface soil and vegetative layer up to 0.1 m to 5.3 m thick.

The Quaternary deposits are composed of clay varieties and non-subsiding sandy silts of solid to fluid consistency, non-subsiding clays of solid, semi-solid and tough-plastic consistency. Sand varieties occur only in the form of interbeds and lenses.

The Quaternary clay cover has a thickness from 0.3m to 2.4m in the western and south-western part of the site, increasing up to 11.5m in its central part and up to 14.8m in the northern, eastern and south-eastern parts of the site. The hypsometric surface of the Quaternary deposit roof is uneven with a slope from south-west and west northwards (western part of the site) and eastward varying from 197.31m to 205.48m in the west and up to 190.06m in the east.

In the Upper Permian eluvial deposits, there is an erosion paleointrusion filled with Quaternary clays and sandy silts.

The roof of the Upper Permian eluvial deposits has also a slope from west and south-west northward (in the west of the site) and eastward. The absolute elevations in the south and south-west of the site are 204.78 – 194.24 m lowering down to 175.57 m in the east.

In the north-eastern part of the site there is a dip of the Upper Permian deposit roof in the reverse direction, i.e. from north-east westward.

The exposed thickness of the Upper Permian deposits is from 0.2-0.5m to 6.0m and in the eastern and central parts of the site and up to 14.3m in the western and south-western parts of the site.

The Upper Permian deposits are composed of fine- and micrograin sandstones with clayey cement, weak, often weathered to a condition of sand, sometimes with interlayers of medium strength, greenish-brown, grey, brownish and reddish-brown, free of water and water-bearing; and solid clays, brown, dark and reddish-brown, with interlayers of siltstone, limestone and sandstone.

Furthermore, according to a statement of 09.12.2005 by the Territorial Agency for Subsoil Resources of the Republic of Tatarstan, no deposits of valuable minerals have been discovered within the area of planned construction.
2.3.6 Soil

Soil Types

Three soil types are most common in Nizhnekamsk District: grey forest soils, chernozem soils and podzolic sod soils.

Grey forest soils occur in elevated areas and are rich in nitrogen, absorbed potassium and well assimilable phosphorus. Light grey soils are common in interfluvial zones, on plateaus between gullies and in upper portions of gentle slopes; they have different outwash degrees. The soils have a low content of phosphorus and potassium compounds and are similar to podzolic sod soils. Chernozem soils are leached, with a high and medium thickness, the humus thickness reaches 35cm to 80cm.

Podzolic sod soils are sod soils of strongly, medium and slightly podzolic types. The first two types have a low content of nutrients for plants, poor water and physical properties. Slightly podzolic sod soils are of sand and silty sand types with respect to their mechanical composition; they are common on the left-hand bank of the Kama River. As to the mechanical composition of the podzolic soil type, prevailing are clayey, heavy sandy silt and sandy silt soils.

Soil Contamination with Heavy Metals

A soil survey and soil sampling to determine heavy metal concentrations were carried out in 2005 at the construction site by the Department of Hydrometeorology and Environmental Monitoring of the Republic of Tatarstan.

The collected soil samples complied with the reference levels of permissible concentrations of copper, zinc and lead. Eleven samples out of 80 collected soil samples had nickel and cadmium concentrations exceeding the reference levels of permissible concentrations by as high as 1.6 and 2.3 times, respectively.

The main source of soil contamination with heavy metals is atmospheric precipitation, emissions from industrial operations, transfer with surface runoff and subsurface migration of groundwater.

A comparative analysis of the obtained results suggests the following conclusions:

- The average concentrations of such metals as zinc, nickel and lead in soils in the subject area do not exceed the baseline levels adopted in Central Russia for this soil type (i.e. grey forest soil of sandy clay and clay types);
- The average copper and cadmium concentrations in soils exceed the baseline levels for these metals by 1.5 and 5 times, respectively;
- The computed value of the integrated index of soil contamination with heavy metals is less than 16. So the soils in relation to their contamination within the subject area can be classified as ‘relatively satisfactory category’;
- The level of soil contamination with lead is rated as ‘slight’.

Soil Contamination with Petroleum Hydrocarbons
Based on the results of the survey carried out by the Department of Hydrometeorology and Environmental Monitoring of the Republic of Tatarstan, it was found that the petroleum hydrocarbons concentrations are distributed virtually uniformly throughout the subject site. The average concentration of petroleum hydrocarbons is 75 mg/kg. About 4% of soil samples had a petroleum hydrocarbons content exceeding the baseline level of oil producing regions.

In general, the soil analyses have demonstrated that the soil contamination with petroleum hydrocarbons within the subject area does not exceed the baseline level for oil producing regions (100 mg/kg).

2.3.7 **Vegetative Cover**

Nizhnekamsk District is situated within the forest and steppe zone with alternating forests, steppe areas and meadows. Forest vegetation is associated with catchment areas with well drained grey forest soils and deteriorated chernozem soils. Natural vegetation has been preserved mainly in areas not suitable for development and in protected territories.

The percentage of forest lands has increased during the past 5 years by 1.4%. The forests within the construction site are mainly broad-leaved forests; the prevailing tree species are linden, aspen, oak and birch.

To prevent forest fires and their propagation, appropriate preventive measures are taken annually. About 40 km of fire lines have been constructed and 180 km of existing fire lines are maintained; about 10 km of access roads for fire suppressions were repaired; eight warning posters installed and repaired; two recreational areas constructed. In 2004 no violations of fire safety regulations were reported.

The forest survey conducted over a forest area of over 4,000 ha did not reveal any area with plant pests, but air emissions from industrial operations continue to impact the forests. The forests located to the north-east of the Nizhnekamsk Industrial Zone within an area of approximately 300 ha are exposed permanently to impact of pollutants. The condition of those forests has been deteriorating from year to year. Annual loss of forests exceeds the annual growth. Death of trees, drying of tree crowns and changes in the color of needles and leaves are typical of all forests in the vicinity of the industrial zones.

In 2006 an integrated set of measures was carried out in the area of the Nizhnekamsk Industrial Zone to improve the condition of green areas, parks and areas surrounding residential buildings.

2.3.8 **Wildlife**

Nizhnekamsk District is situated in the northern part of the forest-steppe Central-Eastern Faunal Volga-Kama Region and constitutes a typical forest-steppe area with mixed forests. The fauna of this district is influenced by the forests situated on the right-hand bank of the Kama River and the steppes.
located to the south. In general, 62 mammal species are recorded in the given
faunal district, of which 19.3% are typical forest animals and 16.1% are typical
steppe animals.

The birds include bird species of both boreal forests and steppes.

The area of the industrial zone itself is not a permanent habitat to any
mammal and bird species considered as rare and endangered.

The ichthyofauna is associated with the Kama River and its major tributaries.
Commercial fish species include Sterlet sturgeon, bream, roach, silver bream,
zepe, sabrefish, zander, pike, asp (zherekh), freshwater catfish, European carp,
nerfliung, burbot, Volga zander, perch, crucian carp, silver-eye fish, muvarica
and river sprat.

There are spawning grounds of commercial fish species in shallow areas of the
Old Kama River and on the Kotlovsky Island flooded in spring. No wintering
grounds have been reported.

2.4 **NATURAL HAZARDOUS PHENOMENA AND PROCESSES**

No hazardous natural processes (landslides, karsts, earthquakes, etc.), which
require special engineering protection of buildings and sites, have been
reported.

Based on the characteristics of soils and water and taking into account the
entire range of decisive factors, the construction site is rated as Category II of
complex engineering geological conditions and the surveyed area is suitable
for construction and operation.

**Soils:**

- No hazardous physical geological processes and phenomena have
  been reported;
- There are no unfavorable specific properties of soils used as natural
  foundation (such as subsidence, heaving, high salinity, high silt or peat
  content, etc.);
- Within the zone of natural foundation, there are some unevenly
  weathered eluvial Upper Permian sandstones and clays, having non-
  uniform compressibility under the impact of external loads (occurring
  in the western and south-western parts of the site);
- Within the zone of natural foundation, there are some soils with weak
  bearing capacity (in the northern, eastern and south-eastern parts of
  the site);
- Soils have frost heaving properties when frozen in winter in case of
  saturation (in autumn) with water of natural or man-made origin;
- The rated ground freezing depth is 1.7 m, but during especially cold
  winters it might reach in areas free of snow 1.9m to 2.0m;
- Low corrosive activity of soils in relation to lead structures and
  alumina cable sheaths.

**Surface and Underground Waters:**
Groundwater occurs at shallow levels and in the upper portion of the cross-section; occurrence of irregular shallow temporary water (verkhovodka) is possible;

According to the laboratory analyses, underground waters have low corrosive activity with respect to concrete;

The site is not exposed to flooding with water from surface water bodies;

In some areas the surface runoff does not drain from the site;

In the upper portions of the cross-section, irregular shallow temporary water (verkhovodka) is formed locally from time to time.

In the process of construction it will be required to take the following measures foreseen in the construction norms SNiP 2.01.15-90 “Engineering protection of sites, buildings and installations against hazardous geological processes” and SNiP 2.06.15-85 “Engineering protection of sites against flooding and saturation of soil with water”:

- protection of soils against additional weathering, saturation with water and freezing during construction and operation;
- use of enhanced anti-corrosion protection, jointly with cathodic polarization, of underground steel structures and networks;
- hydraulic insulation of buried parts of buildings and installations.

### 2.5 PHYSICAL IMPACT FACTORS

#### 2.5.1 Noise Level

Specialists of the FGUZ “Center of Hygiene and Epidemiology in the Republic of Tatarstan”, division for the city of Nizhnekamsk and Nizhnekamsk Municipal District, conducted a survey aimed at measuring noise levels at control points located inside and outside of the united SPZ of the Nizhnekamsk Industrial Zone. The measured values were compared with the requirements of the sanitary norm SN 2.2.4/2.1.8.562-96 “Noise Level at Workplaces, in Residential and Public Buildings and in Residential Areas”.

Main sources of noise within the USPZ of the Nizhnekamsk Industrial Zone are production facilities (individual installations, auxiliary equipment, pump and compressor stations installed both outdoors and indoors, boilers, construction machinery, etc.), highways, railroad traffic and yard locomotives, transport vehicles and street traffic.

The equivalent noise level was measured at 20 points (measuring points). Based on the measured values obtained during day time (from 2 until 8 PM) and night hours (11 PM until 2 AM), the equivalent and maximum noise levels were determined. The recorded noise levels in the area of the construction site were rather high and stable: 76.2 dBA during day time (max. 86.7 dBA) and 74.1 dBA at night (max. 80.7 dBA); the difference between noise levels during
day and night hours was 2.1 dBA (6.0 dBA for max. levels). The nearest noise sources are the boiler station of the co-generation plant TEC-2, the railroad track, and the equipment base of OAO “Nizhnekamsk Neftekhim”. Nevertheless, the equivalent noise level is within the permissible limits.

To determine the noise impact levels caused by the Nizhnekamsk Industrial Zone at the SPZ boundary, some calculations were made to assess the noise levels on the basis of the measurements of the equipment values within the industrial zone in accordance with the construction norm SNiP CHнП 23-03-2003 “Protection against Noise”.

The calculated noise levels in the villages of Prosti, Martysh, Ishteryakovo, Klyatle and Alan indicate that the noise generated in the industrial zone does not have any effect on the noise pressure level in the above residential areas, with an exception of Martysh, where this effect was estimated at 18.2 dBA at day time and 16.1 dBA at night (which is significantly lower than the limits set in the sanitary norm SN 2.2.4/2.1.8.562-96 “Noise Level at Workplaces, in Residential and Public Buildings and in Residential Areas”). This means that noise generated within the industrial zone do not increase the noise pressure levels in the residential areas listed above.

2.5.2 Electromagnetic Emissions

According to a letter of the director of the Territorial Department of Rospotrebnadzor in the Republic of Tatarstan, there are following electromagnetic emission sources are within the Nizhnekamsk Industrial Zone:

1. OAO “NizhnekamskNeftekhim”: 9 radio communication facilities;
2. OAO “NizhnekamskShina”: 9 radio communication facilities;
4. OAO “NizhnekamskTehUglerod”: 2 base radio trunk stations;
5. Nizhnekamsk co-generation plant TEC-1: 2 base stations of cellular networks;
6. BSI-2, KamEnergoStroiProm: 2 base stations of cellular networks;
7. Nizhnekamsk alcoholic beverage plant: 1 base station of cellular networks;
8. NK-RTI-Service: 1 base station of cellular networks;
9. OOO “Behetle-Agro” (Settlement of Borok): 1 base station of cellular networks;
2.5.3 **Radiological situation**

*Radionuclide content in soils*

According to an integrated survey carried out by Roshydromet in 1988-1992, the territory of Nizhnekamsk District was not exposed to direct contamination with radionuclides as a result of the accident at the Chernobyl nuclear plant. Special investigations conducted by the RT Department of Hydrometeorology and Environmental Monitoring for preparation of a radiological and hygienic passport of the Nizhnekamsk District demonstrated that the average value of soil contamination density with cesium-137 was 0.8 kBq/m$^2$ (soil samples were collected in residential areas and on farming land), which is lower than the average background value for Russia (1.9 kBq/m$^2$).

The specific activity of potassium-40, radium-226 and thorium-232 was virtually identical in all soil samples; its value corresponded to the natural concentrations of those radionuclides in soils.

On the basis of the data of dosimetric measurements, the construction site is rated as clean in radiological respect.

2.6 **Socioeconomic Conditions**

2.6.1 **Socioeconomic Characterization of the District**

The construction site for Stage 1 is located in the Nizhnekamsk Municipal District, in the Republic of Tatarstan, at a distance of 5km to the south-east of the residential areas of the city of Nizhnekamsk.

According to the data provided by the district administration, the population of the district is estimated at 264,949 (as of 01.07.2008), including 226,530 people living in the city of Nizhnekamsk and 23,619 residents living in 15 settlement in rural areas. During the period of January-June 2008 the population of the city decrease by 112 residents, mainly as a result of emigration of 419 residents whereas the natural population growth was 307 people. During the same period, the rural population increased by 38 persons, including a natural decrease by 113 persons and immigration of 151 persons.

The percentage of men and women is 47.3% and 52.7%, respectively. The proportion of residents able to work is 60.0%, children and teenagers 17.1% and pensioners 22.9%.

As of 01.07.2008, there were 1,469 unemployed persons registered in the unemployment agency and searching for jobs. The unemployment rate decreased in comparison with the similar period of the previous year by 9.9%. 1,169 persons, or 79.5% of all unemployed persons, receive unemployment relief. As of 01.07.2008, the overall level of registered unemployment was 1.17% of the active population of the district and 0.8% in the city.

The average monthly wage in January-June 2008 was 16,251.0 Rubles in the city and 9,593.8 Rubles in the district. Compared to January-June 2007, it represents an increase of 24.4% in the city and of 45% in the district.
The level of real wages and salaries of all employees of large and medium-size enterprises in the city calculated with due consideration of the consumer price index for goods and services has increased in 2008 by 9.7% in comparison with January-June 2007.

The average number of employees in the organizations not belonging to small businesses was 92,775 in January-June 2008, which means an increase by 530 persons as compared with the similar period of 2007.

The average pension was 3,964.7 Rubles as of July 01, 2008, an increase by 31.7% in comparison with January-June 2007 (3,009.9 Rubles). The number of pensioners in the city and the district is 60,913 persons (22.9% of the total population, including 22,413 pensioners who have a job.

The Nizhnekamsk Department of the Pension Fund fixed 2,661 pensions, including 351 social pensions (13.1%) based on the state pension security and 2,310 employment pensions (86.8%).

Out of the total number of employment pensions, 2,246 pensions (84.4%) were fixed on the basis of personified records, of which 2,241 pensions (84.2%) were fixed taking into account the paid insurance charges.

There was no overdue indebtedness relating to payment of wages and salaries as of July 01, 2008.

In January-June 2008, the organizations of all types shipped their products and provided services, including their own products and those purchased from external organizations, and including the sales revenues for an amount of 133,567.6 million Rubles.

The largest proportion in the total volume of products belongs to petroleum products (50.8%), chemical products (36.5%), generation and distribution of electricity, steam and hot water (5.9%) and manufacture of rubber and plastic products (3.8%).

The labor productivity in January-June 2008 was 1,354,000 Rubles per person, which amounts to 143.9% of the 2007 level.

The index of industrial production (IPP), the aggregated index which details out the growth of the following sectors: “mining for valuable minerals”, “manufacturing”, “generation and distribution of electricity, gas and water”) amounted in January-June 2008 to 109.8% (compared to 111.2%during the similar period of 2007).

The IPP for main types of activities from the beginning of 2008 was as follows:

- production of petroleum products 114.4%
- production of chemicals 106.6%
- production of rubber and plastic products 102.7%
- production of food products 98.3%
- manufacture of finished metallic components, machines and equipment 151.1%
- production of other non-metallic minerals 104.5%
- production of electricity, gas and water 96.4%

The production of the following products increased during the said period and reached the following levels:
• synthetic rubber 218,600 t (an increase by 9.7%);
• ethylene 127,100 t (an increase by 1.8 times);
• tires 5,959,700 tires (compared to 5,960,000);
• prefabricated reinforced concrete products 145,300 m³ (an increase by 19.4%)

A decrease in the production of the following products was reported:
• styrene 84,100 t (a decrease by 19.7%) (it should be noted that the sales of ethylene, which is a semi-finished product used of styrene production, has increased);
• technical-grade carbon 45,700 t (a decrease by 21.9%);
• electricity generation 1,584 million kWh (a decrease by 40.4%);
• heat energy supply 5,198,000 Gcal (a decrease by 35.2%);
• bread and bakery products 6,300 t (a decrease by 7.7%) (the trading centers “Bahetle”, “Essen”, etc. reduced the amounts ordered from the Nizhnekamsk Bakery Combine and increased sales of bakery products imported from other regions and increased their own production);
• alcoholic beverages 195,000 decaliters (a decrease by 7.6%) (The production capacities were used at 56%. The retail shops are interested to sell products imported from outside of the Republic of Tatarstan because of the lower purchase prices).

In January-June 2008, the amount of work performed by companies involved in construction reached 3,896,200 million Rubles, an increase by 66.9% in comparison with January-June 2007 (2,333,900 million Rubles).

Surface of housing built is 46,500 sq.m, which is by 19,200 sq.m less than during the similar period of 2007. In total, 128 apartments were completed with a total area of 7,200 sq.m.

Individuals constructed 14,100 sq.m of housing, i.e. 135 houses (88 houses, 10,800 sq.m in 2007).

2.6.2 Review of Interested Parties (Stakeholders) and Vulnerable Groups of Population in Connection with Project Implementation (Stakeholder Analysis)

Organizations and groups of population, which may be affected by the Project, can be divided into several categories.

First of all, they include the relevant supervisory agencies, which issue approvals, conduct review of project documentation and give permits for air emissions, waste disposal and operation of potentially hazardous industrial facilities. This group of organizations includes:

1. Department for engineering and environmental supervision of Rostekhnadzor in the Republic of Tatarstan;
2. Department of Environment Protection of the RT Ministry of Natural Resources;
3. Interregional department for supervision over explosion-hazardous chemical and hazardous facilities;
4. Department of Architecture and Urban Planning of the Republic of Tatarstan;
5. Department of the Federal Service for Supervision over Use of Natural Resources in the Republic of Tatarstan;
6. Interdistrict Environmental Prosecutor’s Office of Tatarstan;
7. State Prosecutor’s Office of Tatarstan.

Representatives of the governmental bodies at the federal, regional and local levels are interested in the Project’s compliance with the laws relating to labor relations, employment, education, public health, youth policy. The main issues are provision of housing, employment of the local population and economic development in connection with the Project implementation.

The vulnerable groups of the population exposed to potential impact of the Oil Refinery are the communities in the following residential areas:

1. Village of Alan (potential resettlement form the zone affected by the Project);
2. Village of Martysh (potential resettlement form the zone affected by the Project);

The following non-governmental social and environmental organizations are active in the Nizhnekamsk District; they can inquire information about the progress of the Project implementation and its environmental performance at all phases and if necessary can address claims and complaints to the relevant supervisory agencies:

1. Children’s Environmental and Biological Center of the city of Nizhnekamsk;
2. Children’s public organization “Protectors of Nature”, city of Yelabuga;
3. Environmental voluntary society of students at the Yekaterinburg State Polytechnic University “EcoDOS” (based at the biological and agricultural department of the university);
4. Division of the Russian Environmental Party “The Greens” in the Republic of Tatarstan;
5. Nizhnekamsk organization of the Election Block “Equality and Legality”;
6. Nizhnekamsk organization of the Communists of the RT;
7. Regional Youth Public Organization for occupational orientation of children and social adaptation of the youth “Vozrozhdeniey”;
8. Trade union organization of employees in the field of health care in the city of Nizhnekamsk and Nizhnekamsk District;
11. Nizhnekamsk city’s trade union Organization of the Tatarstan Organization – Trade Union of Employees of Educational and Science Institutions of the Russian Federation;


13. Nizhnekamsk District Trade Union Organization of employees of state institutions and public services of the Tatarstan division of the National Organization “Trade union of employees of state institutions and public services of the Russian Federation”;


15. Youth’s regional public organization “Legion” of the Republic of Tatarstan;

16. Public organization “Nizhnekamsk Ethnographic, Cultural and Educational Society of Kryashen Ethnic Communities”.

Potentially, the following research organizations and institutions are also interested in the Project implementation:

1. OAO “NefteProductProject”;

2. OAO “GiproKauchuk”;

3. ZAO “PromTrans NII Project”;

4. OAO “Nizhny Novgorod NII NefteProject”;

5. ExpertSpecProject;

6. OAO “OmskNefteKhimProject”;

7. OAO “BashGiproNeftekhim”;

8. OAO “NefteKhimProject”;

9. PI “TatNIPI Neft”;

10. OAO “VNII Neftemash”;

11. RT Academy of Sciences, OAO “VNIUIS”, Kazan;

12. Kazan State University, etc.

Public hearings on the materials of the mandatory EIA were organized upon an initiative of TANECO by the regional division of the RF Communist Party in the Nizhnekamsk municipal district. This mandatory EIA is a part of the Feasibility Study for Investment for the whole Complex prepared by VNIPIneft As explained above (see Section 1.7.1), additional public consultation are to be organized by TANECO.

According to OAO “TANECO”’s department of corporate image and public relations, the environmental activity of the district’s population is minimal. The key issue is the creation of new jobs which are expected in connection with the Project construction and operation.

The fact that there is no sharp criticism on the part of the stakeholders is attributed, among other things, to the fact that Mr. Kh.A. Bagmanov, TANECO General Director, is a deputy of the Nizhnekamsk city council and receives inquiries and proposals from the population during his hours in his deputy’s office, and considers them both at the level of the municipality administration and OAO “TANECO” management.
### Location of existing residential areas and communities within the zone of potential impact of the Project

**Table 2.6-1. Location of residential areas in relation to TANECO Complex facilities**

<table>
<thead>
<tr>
<th>Name of residential area</th>
<th>Distance from the Project boundary</th>
<th>Population</th>
<th>Additional information</th>
</tr>
</thead>
</table>
| Village of Alan          | 1.3 km to the north-west          |            | - According to Afanasyevo Council of Rural Settlement, there are 69 houses, of which:  
  - In 19 houses 47 residents are registered;  
  - In 47 houses there are no residents registered (in 4 houses the owners died and there are no heirs;  
  - For 4 houses there are no technical certificates);  
  - 3 house owners own 2 houses each;  
  - There are also 88 land plots with orchards.  
  Potential resettlement from the zone impacted by the Project may be envisaged (see Section 5.10) |
| Village of Martysh       | 2.5 km to the south-east          | 43 persons | Potential resettlement from the zone impacted by the Project may be envisaged (see Section 5.10) |
| Settlement of Klyatle    | 3 km to the south                 | 91 persons |                        |
| Settlement of Balchikly  | 4 km to the south-west            | 163 persons|                        |
| Settlement of Klych Truda| 4 km to the south                 | 29 persons |                        |
| Settlement of Ishteryakovo| 3 km to the south-east          | 639 persons|                        |
| Settlement of Avlash     | 4 km to the south-east            | 104 persons|                        |

* According to the director of the Tukaevsky Territorial Division of the Federal Service of State Statistics in the RT and the official website of the Nizhnekamsk Municipal District (http://www.e-nkama.ru)

The settlements of Martysh and Alan are situated within the zone of direct impact of the Project (i.e. within the preliminary USPZ). The RT Cabinet of
Ministers has asked that until the issue of resettlement is finally resolved the procedure of registration of citizens be suspended, no land plots be allocated, cadastre records not changed and no sale and purchase transactions with immobile property be registered (Letter of 11.08.2008).

The Project construction site belongs to the Nizhnekamsk Industrial Zone. In 2007 a design of the united SPZ of the industrial zone was developed. Besides the listed above settlements, the following settlements are located outside of the USPZ, but may be impacted by the Industrial Zone pollution (air pollutant concentrations estimated above 0.05 MPC but below 1 MPC): Nikoshnovka (to the south-east of the industrial zone), Prosti (to the north), Stroiteley (to the west) and the city of Nizhnekamsk (to the north-west). The air monitoring at the boundary of the USPZ is envisaged by the ESMP and the monitoring program. In case air quality norms are not complied with (in respect to pollutants emitted by the TANECO Oil Refinery), it is suggested to measure the air quality on a regular basis in the following settlements: Nikoshnovka, Prosti, Stroiteley and the city of Nizhnekamsk. If the measured concentrations of air pollutants are less than 1.0 MPC no additional measures are required; if the measured concentrations exceed 1.0 MPC then the size of USPZ area could be revised (e.g. enlarged). The corresponding amendments are reflected in the monitoring program and will be amended in the ESMP.

2.6.4 Description of Initial, Current and Future Land Use within the Area Potentially Affected by Stage 1 Implementation

The construction site for the TANECO Complex is located in the Nizhnekamsk Municipal District in the Republic of Tatarstan. It is situated within the industrial zone, to the south of the first technological zone of the OAO “Nizhnekamsk Neftekhim” Company. The Oil Refinery is rated as facility of Hazard Class I with a regulatory SPZ 1,000m wide. To the west of the site there are some agroindustrial facilities and construction industry facilities at a distance of over 4 km and a gas condensate plant at a distance of 200m. To the east of the site, there are sludge disposal areas of the cogeneration plant TEC-2. The Kama River flows to the west of the site at a distance of 10 km.

According to the General Layout Plan of the TANECO Complex, forest land of the Biklyanskooye division of the Nizhnekamsk Forestry Department is allocated for the Complex within compartments 95, 96, 97 and 107 (forests of Group 2) and compartments 85 and 86 (forests of Group 1). The total site area within the fencing is 396 ha.

It is planned to construct a landfill outside of the main site for industrial waste disposal during Stage 1 construction. More detailed information on the landfill construction is discussed in Section 5.5.

The land plots to be used for construction of the planned facilities were rated as forest land. They have been reclassified to the category of land for industrial development. They are leased from the land owner, i.e. the territorial Department of the Ministry of Land and Property Management of
Tatarstan in Nizhnekamsk District. The Company owns also a land plot of 249,248 m² located on the land for residential areas (Certificate of 05.11.2003). Construction of Stage 1 has already started. Accommodation facilities have been constructed (46,000 m²) in the city of Nizhnekamsk for temporary accommodation of construction workers and in the future the operating personnel. Now the plan is to build additional housings of 160,000 m².

The selected site for the TANECO Complex is crossed by the existing high-voltage power transmission lines (100 kV and 220kV), a motor road to Ishteryakovo and a drainage sewer line. All existing engineering networks and facilities within the outlines of the construction site are subject to relocation and dismantling.

There are two settlements located in the direct vicinity of the Project construction site: Alan (2km to north-west) and Martysh (2.5 km to south-east), which are situated within the preliminary USPZ of the Nizhnekamsk Industrial Zone. Resettlement of the two villages may be envisaged, depending of new calculation of pollution level after commissioning of the Oil Refinery. This issue is discussed more in detail in Section 5.10.

### 2.6.5 Public Health

According to the data provided by the District Administration in relation to the public health situation in the Nizhnekamsk Municipal District, the public health system consisted at the beginning of 2008 of the following institutions: 9 major hospitals and dispensaries, 10 polyclinics, 2 major district hospitals, 5 outpatient stations, 25 first-aid and obstetrics stations, ambulance station, dental polyclinics, etc.

Medical assistance is provided by the following organizations:

<table>
<thead>
<tr>
<th>At municipal level</th>
<th>At regional level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Nizhnekamsk multi-profile city hospital No.3</td>
<td>1. Dermatovenerologic dispensary</td>
</tr>
<tr>
<td>2. Central District Hospital</td>
<td>2. TB dispensary</td>
</tr>
<tr>
<td>3. Children’s District Hospital</td>
<td>3. Psychoneurologic dispensary</td>
</tr>
<tr>
<td>4. City Hospital No.2</td>
<td>4. Narcological dispensary</td>
</tr>
<tr>
<td>5. Maternity hospital</td>
<td>5. Hemotransfusion station</td>
</tr>
<tr>
<td>6. Ambulance station</td>
<td>6. Children’s therapeutic resort</td>
</tr>
<tr>
<td>7. Dental polyclinic</td>
<td></td>
</tr>
<tr>
<td>8. Kamskopolyanskaya City Hospital</td>
<td></td>
</tr>
<tr>
<td>9. Medical exercise dispensary</td>
<td></td>
</tr>
<tr>
<td>10. Medical preventive center</td>
<td></td>
</tr>
<tr>
<td>11. Medical information and analytical center</td>
<td></td>
</tr>
<tr>
<td>12. 25 first-aid and obstetrics stations</td>
<td></td>
</tr>
</tbody>
</table>

In 2007 the number of employees in the public health sector is 5,655 persons, including 860 doctors and 3,030 paramedical personnel.
The average monthly salary in the public health sector in 2007 was 8,287 Rubles; the average salary of doctors was 17,309 Rubles, that of paramedical personnel 7,575 Rubles (including paid services).

The expenditures for the public health sector in 2007 amounted to 1,065.3 million Rubles. The percentage of the funds for compulsory medical insurance in the total consolidated budget of the public health sector is 44%; the proportion of the local budget is 22%, extra-budgetary funds 24% and the national project “Health” 10%.

The per capita expenditures for the public health sector amounted in 2007 to 951.7 Rubles (compared with 2,147.6 Rubles in the RT and 868.9 Rubles in municipal medical preventive institutions); for the compulsory medical insurance it was 1,716.7 Rubles (1,835.1 Rubles in the RT) and in municipal medical preventive institutions 1,457.2 Rubles.

The national project “Health” permitted strengthening of the financial and technical basis of the public health sector. During the past 2 years, the medical institutions of Nizhnekamsk have purchased the following equipment:

1. 21 units of equipment for an amount of 24 million Rubles;
2. 14 ambulance vehicles for an amount of 10 million Rubles;
3. Equipment for an amount of 17 million Rubles for maternity consulting centers and maternity hospital for maternity certificates.

Over 200 million Rubles have been spent within the framework of the national project “Health” since 2006.

In 2007, the sickness rate increased by 7.2% (1,020.5 per 1,000 of population) in comparison with the previous year. During the past 5 years the sickness rate has increased by 8.4% (from 771.3 up to 825.7 per 1,000 of population). This figure is higher by 23.6% than that for the RT as a whole.

The sickness rate among children under the age of 14 years has increased over 5 years from 1,390.5 to 1,631.4 per 1,000 (an increase by 41.9%). In comparison with 2006, the 2007 sickness rate among the children has increased by 17.4%.

Among teenagers in the age of 15 to 18 years the sickness rate has increased during the past 5 years by 82.4% and is 1,663.3 per 1,000. In comparison with 2006, there is also an increase by 20.7%.

In 2007, the rate of primary permanent disability among the adults had increased in comparison with 2006 by 24.6% up to a level of 86.6 per 10,000 of adult population (94.1 for the RT as a whole).

Among the economically active population, the rate of primary permanent disability decreased from 33.4 in 2006 down to 24.6 per 10,000 in 2007.

The situation with socially significant diseases has changed substantially. Tuberculosis has had a tendency to reduction during past years. In 2007 it was at the level of the previous year (41.9 cases), but lower than for the RT as a whole by 28.6% (58.7 per 100,000).

The indicator of primary psychic derangement cases had decreased by 21.2% in 2007 in comparison with 2006; 151.6 cases per 100,000 of population were reported. This figure is lower by 38.5% (246.7 per 100,000) for the RT as a whole.
In 2007, 218.3 cases of narcological diseases, including alcoholism, alcoholic psychosis, drug addiction and toxicomania, were reported, which is lower by 9.3% than in the RT as a whole (240.8 cases per 100,000).

The city of Nizhnekamsk and Nizhnekamsk District take the 15th place among the districts of the RT in relation to the number of HIV-infected persons with 28.8 per 100,000.

In 2007, the sickness rate of oncologic diseases had decreased by 2.9% (10.0 cases per 1,000) as compared with 2006. The rate of 10‰ is higher than the figure of the RT by 6.4% (9.4‰ for the RT). A decrease was reported for all age groups of the population. Among the adult population it decreased by 3.1%, among teenagers by 23.8% and among children by 1.5 times.

In 2007, oncologic diseases had the second place in the structure of the death causes in the city of Nizhnekamsk and the Nizhnekamsk District with 14.3% (compared to 13.7% in 2003, 15.7% in 2004, 15.9% in 2005 and 13.6% in 2006). The percentage of lethal cases of oncologic diseases in 2007 was 1.7%, an increase by 21.4% against 2006 (1.4%).

The percentage of deaths caused by cancer among adult population in relation to the number of diseases was 4.0% in 2007 compared to 3.9% in 2006, 4.9% in 2005, 4.5% in 2004 and 4.4% in 2003.

In 2007 the number of cases of temporary disability was 66.9 per 100 persons having employment, which is higher by 52.7% than the figure for the RT (43.8 cases) and the Nizhnekamsk District ranked in the RT second after the city of Zelenodolsk in this respect.

The number of days lost as a result of disablement was 908.1 days per 100 employed persons; this is higher by 55.6% than the figure for the RT (583.6 days).

The death rate among persons in economically active age decreased from 467.8 in 2006 (602.1 in the RT) down to 458.9 in 2007 (584.5 in the RT).

2.6.6 Residence or Use of the Area Selected for Project Implementation by Indigenous People (Indigenous Ethnic Minorities)

No indigenous people/ethnic minorities live within that territory.

The Project will be implemented at a distance of 5 km from the city of Nizhnekamsk with a 226,000 population (2007). The ethnic composition of the population is as follows: Tatar (46.5 %), Russian (46.1 %), Chuvash (3.0 %), Ukrainians (1.0 %) and Bashkirs (1.0 %) (1989). The city was established in 1961 in connection with the development of the petrochemical sector. Until 1966 it had a status of a settlement for workers.

2.6.7 Archeological, Historic or Cultural Heritage

According to a statement of 08.12.2005 by the Main Department for Governmental Control of Protection and Use of Historic and Cultural Memorials, no archeological sites have been identified within the construction area.
3 DESCRIPTION OF THE TANECO COMPLEX AND STAGE 1

3.1 GENERAL LAYOUT. BASIC PROVISIONS

The construction site for the Oil Refinery (Stage 1) and the envisaged Stage 2 and Stage 3 of the Complex of OAO “TANECO” is located within the industrial zone of the city of Nizhnekamsk to the south of the 1st technological zone of OAO “NizhnekamskNefteKhim”.

The planned Complex shall comprise:
- Oil refinery (Stage 1);
- Deep conversion plant (Stage 2);
- Petrochemical plant (Stage 3).

The construction will be performed in three stages. Stage 1 includes the oil refinery facilities; the deep conversion and the petrochemical plant will be constructed at a later stage after Stage 1 is completed.

The construction site is located within forest compartments Nos. 85, 86, 95, 96, 97 and 107 of the Biklyanskoye division of the Nizhnekamsk Forestry Department, Republic of Tatarstan, Volga Federal District of the Russian Federation. The overall area of the Complex site is 396 hectares.

An additional area of 11.3 hectares outside of the main site is allocated for a commercial tank farm for propylene storage and a landfill for industrial waste disposal.

The main parameters of the site’s layout and distribution of areas for individual parts of the Complex are given in Table 3.1-1.

Table 3.1-1. Main parameters of the general layout of the TANECO Complex

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit of measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of the main site within the fencing</td>
<td>Hectare</td>
<td>396&lt;sup&gt;18&lt;/sup&gt;</td>
</tr>
<tr>
<td>Area occupied by technological installations</td>
<td>Hectare</td>
<td>89,8</td>
</tr>
<tr>
<td>Area for intermediate storage tank farms</td>
<td>Hectare</td>
<td>7,3</td>
</tr>
<tr>
<td>Area for storage tank farms for crude oil and final products</td>
<td>Hectare</td>
<td>66,32</td>
</tr>
<tr>
<td>Area for water supply and sewerage facilities</td>
<td>Hectare</td>
<td>14,5</td>
</tr>
<tr>
<td>Area for other main buildings and facilities</td>
<td>Hectare</td>
<td>50</td>
</tr>
<tr>
<td>Area occupied by roads and access driveways (i.e. area of roadbed)</td>
<td>Hectare</td>
<td>31,15</td>
</tr>
<tr>
<td>Area for railroad tracks</td>
<td>Hectare</td>
<td>11,28</td>
</tr>
<tr>
<td>Area for aboveground engineering networks</td>
<td>Hectare</td>
<td>12,9</td>
</tr>
<tr>
<td>Area for underground engineering networks</td>
<td>Hectare</td>
<td>28,5</td>
</tr>
</tbody>
</table>

<sup>18</sup> It complies with recommended value designed for best available techniques (200 to 500 ha)
### Description Table

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit of measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total used area</td>
<td>Hectare</td>
<td>311.75</td>
</tr>
<tr>
<td>Built-up area</td>
<td>Hectare</td>
<td>240.82</td>
</tr>
<tr>
<td>Area usage</td>
<td>%</td>
<td>78.7</td>
</tr>
<tr>
<td>Percentage of built-up area</td>
<td>%</td>
<td>61</td>
</tr>
<tr>
<td>Length of fencing</td>
<td>Km</td>
<td>11.5</td>
</tr>
<tr>
<td>Length of onsite motor roads</td>
<td>Km</td>
<td>35.6</td>
</tr>
<tr>
<td>Length of onsite railroad tracks</td>
<td>Km</td>
<td>18.8</td>
</tr>
</tbody>
</table>

General Site Layout of the Complex and location of the Stage 1 facilities are shown in figure 3.1-1.

According to the general layout, the site is divided into several zones:

- the frontal zone located at the north-eastern part of the site and including office, amenities and auxiliary buildings;
- production zone located to the south of the frontal zone and including the Oil refinery, Deep oil processing plant and Petrochemical plant;
- intermediate and commercial storage tank farms located at regulatory distances from the respective production facilities; tank farms for storage of pressurized liquefied hydrocarbon gas and inflammable liquids will be located on separate sites to the south-west of the main site within an area of a backfilled gully;
- storage zone along the railroad lines including warehouses and a storage area for technological equipment.

### Auxiliary Facilities

Main step-down transformer substations will be located along the perimeter of the site in locations convenient for their connection.

In order to control the operations of the facilities, operators’ control stations will be provided.

To ensure fire safety of the operations, the project design provides for installation of firewater tanks, a fire department with 6 fire engines and a fire station with 4 fire engines. The fire department will have an exit to the main highway “Yuzhnaya”.

The general layout of the site includes general amenities with canteens in direct vicinity of industrial areas and other auxiliary facilities taking into account the number of operating personnel.

Three facilities relating to civil defense and emergency response will be constructed on the Site at each stage of the construction of the Complex.

Wastewater treatment and flaring facilities will be located in the eastern part of the site.

It is planned to construct a landfill for industrial waste disposal outside of the site to its north-west. The landfill is designed for a service life of 25 years.

The main aboveground and underground engineering networks have been designed in the strips between the line of the buildings and installations and
the roadbeds, except for the communications networks and the firewater pipeline, which will be laid along the shoulders of the roads. Process water and heating water pipelines will be installed on multi-tier trestles with both pressure and gravity flow pipelines.

Transport
According to the general layout it is planned to construct on-site and off-site access railroad tracks and motor roads.

A railroad station ‘Tungucha’ will be constructed at a regulatory distance from the site for arrangement of trains. It is also planned to construct a railroad station ‘Predkombinatskaya’ with a locomotive and railroad car depot, repair workshops, required infrastructure facilities and other auxiliary facilities and modernize the existing railroad station ‘Biklyan’. The railroad facilities will be constructed under RosZheldor responsibility.

Transport facilities to be built at the same time as the Oil Refinery under the TANECO responsibilities are discussed below:

- The planned onsite motor roads will be constructed in the form of a circular system to ensure onsite traffic, access for fire engines and transportation of operating personnel.
- The main external motor road is the existing road ‘Yuzhnaya’ and the road leading to Ishteryakovo. The section of the Ishteryakovo road crossing the construction site will be relocated to outside of the site in parallel to the site fence along the western and southern parts of the site perimeter.
- In the process of the project implementation it is planned to upgrade the mooring facilities and construct a dock chamber for horizontal unloading of large-size equipment from boats on the left-hand bank of the Kama River in the area of the Afanasovskaya Volozhka (Old Kama) located in the Kama stretch of the Kuybyshevskoye water reservoir.

Main Transport Streams
Supplies of raw materials and shipment of commercial products will be performed:

- via pipelines;
- by vehicles;
- by railroad.

Off-site Infrastructure Facilities
To support the operation of the planned facilities, the following off-site infrastructure facilities have been foreseen in the project design:

- Water supply pipeline approximately 17 km long to be connected to the water supply network of OAO “Tatneft”;
• Outlet for treated wastewater, including construction of a sewer line about 25 km long with one intermediate pump station and a system for scattering discharge of wastewater to the Kama River;
• Off-site crude oil pipelines;
• Off-site pipeline for oil products (modernization of the trunk oil product pipeline Nizhnekamsk – Almetyevsk – Kstovo);
• Off-site pipeline approximately 14 km long for transport of concentrated salt-containing wastewater to the pressure maintenance system for injection into underground formations by the oil producing department “Prikamneft”

This ESIA does not include review of any materials relating to the construction projects of the crude oil and oil product pipelines and off-site railroad lines because in accordance with the Investment Agreement of 03.08.2007 concluded between RosEnergo, RZhD and OAO “Tatneft” RZhD and RosEnergo will be responsible for the construction of the railroad facilities and oil pipelines, respectively. The Stadyia Proekt for these off-site infrastructure facilities which contain all mandatory environmental documentation required by the RF legislation were developed and approved by GlavGosExpertiza in 2007.

The general layout plan of the project design provides improvement of the following areas on the TANECO site, including planting of trees and shrubs:
• the zone of the office building;
• the zone at the main and other entrances to the site;
• areas not to be used for construction;
• areas around the buildings of general amenities, canteens and medical station.

3.2 MAIN OPERATING FACILITIES AND OPERATIONS

The Oil Refinery - Stage 1-, which will have a capacity of 7 million tonnes of crude oil per year, consists of four integrated installations.

The integrated design of the oil refinery ensures most efficient use of the site area and reduces the length of process pipework.

The composition of the oil refinery installations of Stage 1 and their capacities are given in Table 3.2-1.

To the east of the oil refinery at a regulatory distance and in its direct vicinity there will be the zone of intermediate storage tank farms for Stage 1 with required pump stations.

To the south of the intermediate storage tank farms of the oil refinery at a regulatory distance of 100m, there will be the main tank farm for crude oil and oil product storage, consisting of storage tanks with a capacity from 1,000 m³ to 50,000 m³.

The tanks are combined into individual groups of tanks depending on the type of crude oil and oil products to be stored.
Table 3.2-1. Main Production Facilities of Stage 1

<table>
<thead>
<tr>
<th>Description of installations</th>
<th>Purpose of installations / Comments</th>
<th>Capacity, 10^3 t/year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oil refinery (STAGE 1)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Integrated installation with the following sections:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Atmospheric-vacuum distillation unit (CDU/VDU-7):</td>
<td>This unit is designed for crude oil processing to produce the following oil products:</td>
<td></td>
</tr>
<tr>
<td>Atmospheric section</td>
<td>• Fuel gas, straight-run gasoline</td>
<td>7000</td>
</tr>
<tr>
<td>Vacuum section</td>
<td>• Kerosene fraction,</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>• Diesel fuel fraction,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Vacuum gas oil,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Bitumen.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The products will be sent to other units for further processing.</td>
<td></td>
</tr>
<tr>
<td>• Naphtha hydrotreating</td>
<td>Hydrotreating unit for preparation of feedstock for reforming process and purification of liquefied gases</td>
<td>1100</td>
</tr>
<tr>
<td>• Kerosene hydrotreating</td>
<td>Unit for aviation kerosene production</td>
<td>500</td>
</tr>
<tr>
<td>• Diesel fuel hydrotreating</td>
<td>Unit for production of environmentally sound diesel fuel</td>
<td>1600</td>
</tr>
<tr>
<td>• Gas fractionation unit (GFU)</td>
<td>Unit for production of commercial liquefied gases C_3-C_4 and iso-butane separation</td>
<td>400</td>
</tr>
<tr>
<td>• Naphtha splitter</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Integrated installation of aromatic hydrocarbons production consisting of:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Reforming of aromatic hydrocarbons</td>
<td>Production of C_6-C_8</td>
<td>700</td>
</tr>
<tr>
<td>• Reforming splitter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Extraction of aromatic hydrocarbons</td>
<td>Separation of benzenes, toluene and xylenes from other aromatic hydrocarbons</td>
<td>340</td>
</tr>
<tr>
<td>• Paraxyylene separation</td>
<td>Paraxyylene separation</td>
<td>630</td>
</tr>
<tr>
<td>• Isomerization of xylenes</td>
<td>Production of paraxylene from aromatic C_8 (metaxyylene, orthoxyylene, ethylbenzene)</td>
<td>490</td>
</tr>
<tr>
<td>• Transalkylation and disproportioning of toluene</td>
<td>Production of xylenes from toluene and from aromatic C_9 and C_10</td>
<td>130</td>
</tr>
<tr>
<td><strong>Integrated installation consisting of the following sections:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Sulfur manufacture</td>
<td>Utilization of hydrogen sulfide contained in acid gas from amine regeneration and acid gas from acid water steaming to produce technical-grade sulfur as commercial product. Sulfur recovery at least 99.7%. Two production lines each 50% of the design capacity.</td>
<td>300^19</td>
</tr>
<tr>
<td>• Amine regeneration</td>
<td>Regeneration of amine used for gas</td>
<td>According to the</td>
</tr>
</tbody>
</table>

^19 Capacity of the installations is indicated in commercial product rates
Stage 1 includes also the construction of the general facilities, such as a crude oil tank farm with a total capacity of 200,000 m³, intermediate tank farms for respective processes and tank farms for final commercial products.

The process flow diagram for processing high-sulfur crude oil includes advanced highly efficient processes, most of which will be licensed.

The capacities of the process installations for Stage 1 and the respective chosen licensors are given in Table 3.2-2.

**Table 3.2-2. Capacity of process installations of the Complex and Licensors**

<table>
<thead>
<tr>
<th>Description of installations</th>
<th>Capacity, $10^3$ t/year</th>
<th>Licensor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oil refinery and installation for manufacture of aromatic hydrocarbons (Stage 1)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atmospheric distillation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vacuum distillation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Naphtha hydrotreating</td>
<td>1086.2</td>
<td>UOP, USA</td>
</tr>
<tr>
<td>Kerosene hydrotreating</td>
<td>416.1</td>
<td>UOP, USA</td>
</tr>
<tr>
<td>Diesel fuel hydrotreating</td>
<td>1543.4</td>
<td></td>
</tr>
<tr>
<td>Naphtha separation</td>
<td>927.7</td>
<td></td>
</tr>
<tr>
<td>Production of aromatic hydrocarbons</td>
<td>207.8</td>
<td>UOP, USA</td>
</tr>
<tr>
<td>Gas fractionation unit</td>
<td>338.7</td>
<td></td>
</tr>
<tr>
<td>Sulfur manufacture</td>
<td>94</td>
<td>Worley Parsons, USA</td>
</tr>
<tr>
<td>Hydrocracking of distillates</td>
<td>2801.2</td>
<td>Chevron Lummus</td>
</tr>
<tr>
<td>Description of installations</td>
<td>Capacity, 10^3 t/year</td>
<td>Licensor</td>
</tr>
<tr>
<td>------------------------------------------------------------------</td>
<td>-----------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Manufacture of base oils</td>
<td>250.0</td>
<td>Chevron Lummus Global, USA</td>
</tr>
</tbody>
</table>

**Integrated oil processing plant (Stage 2)**

- Flexicoking
- Delayed coking 2281.1 Foster Wheeler USA Corporation (FWUSA)
- Selective deasphalting -
- Hydrotreating of asphalt-free oil -
- Gasification and purification of synthesis gas (to be designed as a separate project) 648.0 GE Energy, USA
- Pure hydrogen production - Haldor Topsoe, Denmark
- Sulfur manufacture 169 Worley Parsons, USA
- Hydrotreating of heavy gas oil from coking 467.4 Axens-Stone&Webster, France
- CCF 962.0 Axens-Stone&Webster, France
- Alkylation 178.6 STRATCO-DuPont, USA

**Petrochemical Plant (Stage 3)**

- Naphtha pyrolysis -
- Polyethylene manufacture -
- Polypropylene manufacture 200.0 Asell
- Propylene oxide manufacture -
- Polyether manufacture -
- Butadiene extraction -
- Hydrotreating of gasoline from pyrolysis -
- Linear alkylbenzene manufacture 90.1 UOP, USA
- Pure terephthalic acid manufacture 237.8 Advansa, UK
- Polyethylene terephthalate (PETP) manufacture 250.0 Advansa, UK
- MTBE manufacture 79.2
3.3 SEQUENCE OF CONSTRUCTION, OPERATION AND CLOSURE OF THE FACILITIES

3.3.1 Sequence of the TANECO Stage 1 construction

Stage 1 will include two groups of facilities to be commissioned at a different time:

- Group 1A (Commissioning 1A), including Subgroup 1A1;
- Group 1B (Commissioning 1B).

The first group (1A) of installations (together with Subgroup 1A1) to be commissioned includes the following:

- Atmospheric-vacuum distillation of crude oil CDU/VDU-7 (1A1);
- Bitumen visbreaking (1A1);
- Naphtha hydrotreating;
- Kerosene hydrotreating;
- Diesel fuel hydrotreating;
- Gas fractionation;
- Hydrogen production;
- Amine purification (1A1);
- Acidic effluent steaming (1A1);
- Sulfur manufacture (two production lines each 50% of the total design capacity) with sulfur granulation and packaging unit (1A1);
- General auxiliary facilities.

The second group of installations (1B) to be commissioned includes the following processes:

- Reforming of aromatic hydrocarbons;
- Extraction of aromatic hydrocarbons;
- Paraxylene separation;
- Xylene isomerization;
- Toluene transalkylation and disproportioning;
- Hydrocracking of distillates;
- Hydrogen production;
- Base oil manufacturing unit;
- Sulfur manufacture (one line with a capacity of 50% of the total design capacity);
- General auxiliary facilities;
- Loading facilities.

It should be mentioned that some offsite units and facilities units incorporated in Stage 2 and 3 will be built during construction of Stage 1. These facilities are mostly auxiliary, i.e. tank farms and infrastructure (roads, railroads and
pipelines, etc). The waste water treatment facilities will be built during Stage 1 construction mainly and however it will contains block for the entire Complex simultaneously. Such sequence of construction allows to optimize the development and construction process and reduce the total cost of the Complex.

Stage 1 facilities are shown in figure 3.1-1 “General Site Layout”.

Final products will be shipped from the railroad and vehicle loading facilities.
To load light and dark oil products, it is planned to construct independent point loading racks to load products into railroad tank cars.
Loading of products will be metered with railroad and truck scales.
Underground tanks will be provided for spill draining in the loading rack area.

3.3.2 Sequence of commissioning

The Stage 1 facilities are scheduled to be commissioned in three groups (1A1, 1A and 1B).
Commissioning of Stage 1A1 is scheduled to be completed by the end of 2009 (according to the Protocol of the meeting on Stage 1A1 implementation schedule dated 12.09.08). Schedule of Stage 1A and 1B commissioning will be defined at a later stage taking into account the actual Stage 1A1 commissioning Date.
A time schedule has been developed for the construction phase covering all types of works associated with construction and commissioning of the planned facilities, from preparation work to adjustment and start-up procedures. The time schedule has been developed taking into account the applicable health and safety requirements, quality control and most economically effective and consistent use of all resources. The schedule will be regularly updated taking into account actual implementation of the construction.

3.3.3 Sequence of the closure of the facilities

When assessing alternatives for the given Stage 1 it was assumed that the service life of the planned facilities will be 20 years. This assumption is standard, although actually the facilities will be operated for a much longer period with subsequent gradual upgrades. Thus, the real life cycle of the planned facilities has not been specified definitely, but it exceeds the framework of reasonable assumptions. As a consequence, the decommissioning sequence has not been considered in this document.
However it is expected that procedures implemented during decommissioning of the Complex facilities will comply with national and international standards in force at the time of the closure of the facilities.
3.3.4 Products to be produced at the Complex

The Complex is designed to produce oil products (gasoline, aviation kerosene, diesel fuel and fuel oil) and petrochemical products (terephthalic acid on the basis of xylenes, polyethylene terephthalate (PETP) on the basis of terephthalic acid, and linear alkylbenzenes (LAB)).

The planned amounts of product output of Stage 1, Stage 2 and 3 are presented in Table 3.3-1 separately. Products from Stage 2 and 3 are indicated for information purpose only. As explained above, the ESIA report only reviews and assesses environmental and social impacts of Stage 1.
### Table 3.3-1. Planned levels of production

<table>
<thead>
<tr>
<th>Product description</th>
<th>Annual production, $10^3$ t/year</th>
<th>Main quality indicators of GOST, TU Norms, EU Standards</th>
<th>Use of product</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
<td>III</td>
</tr>
<tr>
<td>Propane</td>
<td>69</td>
<td>161</td>
<td>161</td>
</tr>
<tr>
<td>Isobutane</td>
<td>35</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Butane-butylene</td>
<td>0</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>fraction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C₅ fraction</td>
<td>180</td>
<td>189</td>
<td>189</td>
</tr>
<tr>
<td>C₆ fraction</td>
<td>196</td>
<td>213</td>
<td>213</td>
</tr>
<tr>
<td>Naphtha for</td>
<td>110</td>
<td>148</td>
<td>155</td>
</tr>
<tr>
<td>petrochemical industry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jet fuel</td>
<td>736</td>
<td>920</td>
<td>861</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diesel fuel, Euro-5</td>
<td>2134</td>
<td>2675</td>
<td>2675</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product description</td>
<td>Annual production, $10^3$ t/year</td>
<td>Main quality indicators of GOST, TU Norms, EU Standards</td>
<td>Use of product</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>----------------------------------</td>
<td>--------------------------------------------------------</td>
<td>----------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>II</td>
<td>III</td>
</tr>
<tr>
<td>Gasoline Regular-92 (AI-92)</td>
<td>351</td>
<td>425</td>
<td>425</td>
</tr>
<tr>
<td>Gasoline Regular-95 (AI-95)</td>
<td>0</td>
<td>425</td>
<td>425</td>
</tr>
<tr>
<td>MTBE</td>
<td>0</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>Benzene</td>
<td>60</td>
<td>67</td>
<td>39</td>
</tr>
<tr>
<td>Propylene</td>
<td>0</td>
<td>202</td>
<td>0</td>
</tr>
<tr>
<td>Polypropylene</td>
<td>0</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>Linear alkylbenzene (LAB)</td>
<td>0</td>
<td>0</td>
<td>80</td>
</tr>
<tr>
<td>Paraxylene</td>
<td>141</td>
<td>141</td>
<td>0</td>
</tr>
<tr>
<td>Polyethylene terephthalate (PETP)</td>
<td>0</td>
<td>0</td>
<td>250</td>
</tr>
<tr>
<td>Raw material for technical-grade carbon</td>
<td>0</td>
<td>59</td>
<td>59</td>
</tr>
<tr>
<td>Fuel oil</td>
<td>2724</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Product description</td>
<td>Annual production, $10^3$ t/year</td>
<td>Main quality indicators of GOST, TU Norms, EU Standards</td>
<td>Use of product</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------</td>
<td>--------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td></td>
<td>Stages</td>
<td>sulfur content max. 3.5% by mass</td>
<td>котельных и технологических установок</td>
</tr>
<tr>
<td>I</td>
<td>II</td>
<td>III</td>
<td></td>
</tr>
<tr>
<td>Granulated sulfur</td>
<td>94</td>
<td>236</td>
<td>236</td>
</tr>
</tbody>
</table>

Products of the Stage 1 facilities will comply with Russian standards except for the diesel fuel Euro-5 which will comply with EU standard.
3.3.5  **Feedstock materials used during operation**

During Stage 1 operation, 75% of Devon oil and 25% of Carboniferous oil (crude with high carbon, highly resinous and with paraffin) will be processed in a total amount of 7 million t per year. This ratio is determined by the maximum permissible sulfur content (3.5% by mass) in high-sulfur fuel oil. Table 3.3-2 contains indicators of the feedstock quality to be used at the planned facilities.

**Table 3.3-2. Quality of crude oil**

<table>
<thead>
<tr>
<th>Description and technical specifications</th>
<th>Devon crude oil</th>
<th>Carboniferous crude oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density at 20°C, kg/m³</td>
<td>872.5</td>
<td>912.7</td>
</tr>
<tr>
<td>Molecular mass</td>
<td>290</td>
<td>317</td>
</tr>
<tr>
<td>Coking ability, %</td>
<td>4.5</td>
<td>7.2</td>
</tr>
<tr>
<td>Kinematic viscosity at 20°C, sSt</td>
<td>20.03</td>
<td>140.8</td>
</tr>
<tr>
<td>Kinematic viscosity at 50°C, sSt</td>
<td>8.62</td>
<td>36.7</td>
</tr>
<tr>
<td>Saturated vapor pressure, kPa</td>
<td>24.6</td>
<td>18.5</td>
</tr>
<tr>
<td>Flash point in enclosed crucible, °C</td>
<td>Below -35</td>
<td>Below -35</td>
</tr>
<tr>
<td>Chilling point, °C</td>
<td>-28</td>
<td>-28</td>
</tr>
<tr>
<td>Total sulfur content, % by weight</td>
<td>1.84</td>
<td>3.8</td>
</tr>
<tr>
<td>Hydrogen sulfide content, ppm</td>
<td>Less than 1</td>
<td>8.4</td>
</tr>
<tr>
<td>Methyl mercaptan content, ppm</td>
<td>Less than 1</td>
<td>0</td>
</tr>
<tr>
<td>Ethyl mercaptan content, ppm</td>
<td>Less than 1</td>
<td>2.3</td>
</tr>
<tr>
<td>Acid number, mg KOH/g</td>
<td>0.01</td>
<td>0.14</td>
</tr>
<tr>
<td>Content, %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Silicagel resins</td>
<td>13.5</td>
<td>18.8</td>
</tr>
<tr>
<td>• Gas up to C₄ inclusive</td>
<td>1.5</td>
<td>1.0</td>
</tr>
<tr>
<td>• Mechanical impurities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Asphaltenes</td>
<td>0.011</td>
<td>0.012</td>
</tr>
<tr>
<td>• Nitrogen</td>
<td>2.7</td>
<td>4.0</td>
</tr>
<tr>
<td>• Vanadium, ppm</td>
<td>0.12</td>
<td>0.26</td>
</tr>
<tr>
<td>• Nickel, ppm</td>
<td>46.9</td>
<td>160</td>
</tr>
<tr>
<td>• Solid paraffins with melting point of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52°C, % by weight</td>
<td>28.9</td>
<td>59.5</td>
</tr>
<tr>
<td>• Salts, mg/dm³ (assumed)</td>
<td>4.4</td>
<td>3.8</td>
</tr>
<tr>
<td>• Water, % vol. (assumed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Up to max 300</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Up to 1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Fractional yield up to 350°C, % by mass</td>
<td>44.29</td>
<td>31.05</td>
</tr>
<tr>
<td>Fractional yield 350-520°C, % by mass</td>
<td>26.24</td>
<td>36.2</td>
</tr>
<tr>
<td>Residue above 520°C, % by mass</td>
<td>29.47</td>
<td>32.75</td>
</tr>
</tbody>
</table>
Crude oil will be supplied from the trunk oil pipeline to the crude oil storage tanks of the Refinery.

The amounts of feedstock to be processed will be specified more accurately in the process of operation and depending on the actual capacity of the Refinery.
4 ALTERNATIVES FOR PROJECT IMPLEMENTATION

4.1 POSSIBLE ALTERNATIVES OF LOCATION OF THE CONSTRUCTION SITE

Pursuant to Decree No.818 of 15.12.1999 by the Cabinet of Ministers of the Republic of Tatarstan “On additional measures for implementation of the project for development of the oil refinery in the city of Nizhnekamsk”, the management of the Nizhnekamsk oil refinery (currently OAO “TANECO”) and representatives of the Nizhnekamsk Forestry Department, Agricultural Cooperative “Shingalchi”, Nizhnekamsk District Department of Construction and Architecture, State Regional Inspection Agency of Environment Protection, Chief Physician of the Nizhnekamsk Sanitary Epidemiological Inspection Agency, Chief Veterinarian of Nizhnekamsk District, Head of the No.62 Paramilitary Fire Department and Head of the Civil Defense and Emergency Response Department considered three alternatives for the location of the Complex:

1. On the farming land of the agricultural cooperative “Shingalchi” adjoining the land of the Nizhnekamsk Forestry Department;
2. On the land allocated for construction of Stage II of OAO “NizhnekamskNeftekhim”;
3. Within compartment 85 and 86 of the Biklyanskoye division of Nizhnekamsk Forestry Department and part of the site allocated to OAO “NizhnekamskNeftekhim” for construction of Stage V of the chemical plant.

It was decided that the most reasonable location from the sanitary, environmental and economic viewpoints was the third alternative, i.e. compartments 85, 86, 88, 94, 95, 96, 97, 98 and 107 of the Biklyanskoye division of Nizhnekamsk Forestry Department.

This area is located to the south of the first industrial zone of OAO “NizhnekamskNeftekhim”.

This site selection for the oil refining and petrochemical facilities is justified by the following factors:

- Need to develop the oil refining and petrochemical sectors in the region on the basis of the available hydrocarbon resources;
- Availability of labor resources in the construction industry, trained personnel for operation of petrochemical plants and existing occupational training centers;
- Initially it was planned to use the existing engineering networks of OAO “NizhnekamskNeftekhim” for the water supply of the new facilities;
- Wastewater will be treated at the local wastewater treatment facilities planned for construction within the framework of the Project;
- Heat energy will be provided from the existing co-generation plant TEC-2;
• Electricity will be provided from the existing co-generation plant TEC-2;
• There are well developed networks of motor roads and railroad lines near the selected site;
• The selected site is located at a considerable distance from residential areas;
• The area potentially affected by the air emission sources of the new facilities will be confined to the united sanitary protection zone of the entire industrial zone; there will be virtually no other impact sources which could affect the local communities, i.e. the impact level is substantially below the maximum levels permitted by the sanitary norms.

The use of the selected site will permit the Company to implement the Project with minimum use of land resources for the needs of the Complex due to much shorter engineering infrastructure networks (i.e. access roads, railroad tracks, heating lines, power transmission lines and oil product pipelines).

4.2 Possible Alternatives for Technical and Technological Design Solutions for Stage 1

In order to achieve all objectives defined for the Complex and ensure at the same time its maximum economic efficiency, six alternative configurations of the Complex were analyzed at the phase of the Feasibility Study. The configuration of the Complex was optimized in line with the objective of the Sponsors. Although the Sponsors will not proceed immediately with the whole Complex, it has been decided to keep the configuration of the Complex and in particular of Stage 1 as it is.

The analysis was started with identification of a basic alternative, which was fixed as a base for the development of other alternative versions. Several options were reviewed differing from each other mainly by the configuration of the deep conversion facilities. In addition, in order to reduce the required capital investments, two other alternative configurations were assessed, which did not comprise a steam cracking installation. The installations for primary crude oil treatment and the aromatic hydrocarbon plant were almost identical for all alternatives considered.

The main differences between the reviewed alternatives were in the methods for use of the residue from vacuum oil distillation (i.e. bitumen).

The reviewed alternatives and configurations for the Oil Refinery are discussed below.

Stage 1 Configuration
Basic Alternative and Alternatives 2 to 5

All alternatives include the same oil processing installations, but depending on the alternative, the products are to be used in different ways as described in more detail below.
The oil refinery will treat products of atmospheric oil distillation. Fuel gas separated from the crude oil will be collected at the top of the atmospheric column and non-stabilized naphtha will condense. This stream of straight-run naphtha and liquefied hydrocarbons will be sent to a separate hydrotreating installation and an associated gas fractionation installation (including an isobutane-distillation column), after which the product will be separated into light and heavy naphtha in a naphtha splitter.

After separation of light naphtha the stream of heavy naphtha will have initial and final boiling points (approximately 65-150°C) meeting the requirements of the plant for the aromatic hydrocarbon reforming installation. This heavy naphtha stream can be used also as a feedstock for a steam cracking installation (Basic Alternative and Alternatives 1 to 3) or sold as naphtha for petrochemical plants (Alternatives 4 and 5).

Similarly, light naphtha can be used as a feedstock for petrochemical processing in a steam cracking installation (Basic Alternative and Alternatives 1 to 3) or sold as naphtha for petrochemical plants (Alternatives 4 and 5).

Non-stabilized naphtha from different installations processing heavier fractions (e.g., from installations for hydrotreating of gasoline, diesel fuel and vacuum gas oil from coking) will be sent back to atmospheric distillation for purification and separation. Gasoline from coking will be sent back to the naphtha hydrotreating installations.

Straight-run kerosene will be used as a feedstock for a kerosene hydrotreating installation. Part of hydrofined kerosene can be used as a feedstock for LAB manufacture; the remaining kerosene will be sold in the local market.

Straight-run gas oil will be processed in a diesel fuel hydrotreating installation to meet the EU norms for diesel fuel. Part of gas oil from the asphalt-free oil (in case of Alternative 3) or part of light gas oil from coking (other Alternatives) can be also further processed in the diesel fuel hydrotreating installation.

**Alternative 6**

A number of modifications had been made in Alternative 6 compared to the above configuration.

First, a gas fractionation installation is planned for the hydrotreatment of liquefied gases from the hydrocracking, aromatic hydrocarbon reforming and naphtha hydrotreating units.

The configuration of the naphtha hydrotreating installation and the naphtha splitter has been also modified. Straight-run heavy naphtha will be separated from straight-run light naphtha and liquefied hydrocarbon gas in a separation column of the naphtha hydrotreating installation and sent to the aromatic hydrocarbon reforming installation.

The naphtha splitter will be used for separation of hydrocracking naphtha into light and heavy naphtha. Heavy naphtha from hydrocracking will be sent to gasoline compounding or be sold as feedstock for petrochemical industry, while light naphtha from hydrocracking from the hydrotreating installation will be sent to a pentane distillation column of the naphtha splitter to produce C5 and C6 fractions.
Configuration of the Project for the Production of Aromatic Hydrocarbons
(for Stage 1)

Basic Alternative and Alternatives 2 to 5

In all considered alternatives, aromatic hydrocarbons will be produced at the aromatic hydrocarbon reforming unit using hydofined heavy naphtha fraction as a feedstock. The sulfur content in the feedstock should be very low (1 ppm). To ensure maximum content of benzene-forming components, the boundaries of heavy naphtha separation by true boiling temperatures are assumed to be 65°C – 150 °C.

The main objective is to ensure maximum production of benzene and paraxylene. The available technologies permit to pre-determine the desirable distribution of yields of aromatic hydrocarbons and in our case neither toluene nor orthoxylene nor metaxylene will be formed. Such an approach is based on the findings of marketing studies conducted by the NIITEHIM Institute.

The first installation of the aromatic hydrocarbon manufacturing facility will be an aromatic hydrocarbon reforming installation (benzene, toluene and xylens). It will produce up to 60% of all aromatic compounds and hydrogen as a by-product. It is expected that the volume of hydrogen production with a purity of approximately 80% will be sufficient to meet the hydrogen requirement of all installations for hydrotreating of straight-run distillates. However, hydrogen of higher purity might be required for diesel fuel hydrotreating. Purer hydrogen can be produced by purification of hydrogen generated in the aromatic hydrocarbon reforming installation. This will be confirmed after consultations with the licensor.

Technology of reforming with continuous catalyst regeneration has been selected for reforming of aromatic hydrocarbons.

The reformate produced will be sent to the aromatic hydrocarbon extraction installation, where simple extraction with suitable solvent will be performed with subsequent fractionation. A combined extraction distillation installation can be used instead.

The following products will be produced as a result of this process:

- Paraffin fraction (raffinate) used as feedstock for steam cracking (Basic Alternative and Alternatives 1, 2 and 3) or to be sold as naphtha for petrochemical industry (Alternatives 4, 5 and 6);
- Benzene fraction, part of which will be used for LAB manufacture in an amount of 80,000 t/year and the balance will be sold in the local market;
- Mixed xylene fraction

Toluene-containing fraction and fraction of mixture of heavy aromatic hydrocarbons C9+ will be also generated at the aromatic hydrocarbon extraction installation. They will be further processed at the transalkylation and disproportioning installations and converted to a mixture of benzene and xylenes.

Moreover, the objective will be to maximize the paraxylene production during Stage 1 operation. For this purpose, it is planned to have an installation for separation of aromatic hydrocarbons by adsorption and desorption on...
molecular sieves with subsequent xylene isomerization. A mixture of xylenes produced as a result of the first-stage extraction and fractionation will be sent to the xylene fractionation section. The final products will be high-purity benzene (to be sold or used for manufacture of linear alkylbenzene, as described above) and paraxylene, which will be sold in the local market or used as feedstock for manufacture of pure terephthalic acid (TPA). The following by-products will be also produced, which require determination of their further use:

- Raffinate, which can be sent for steam cracking or sold as naphtha for petrochemical industry;
- Heavy aromatic hydrocarbons $C_9+$, which is used as a feedstock for the compounding of petroleum (alternative 6) or is used as heating oil combusted in the incinerator of the atmospheric distillation installation (other alternatives).

**Alternative 6**

For Alternative 6, the configuration of the aromatic hydrocarbon reforming installation is modified to some degree. The reformate splitter is combined with the aromatic hydrocarbon reforming installation to form a single unit, in which the reformate stream is separated into light reformate, benzene-containing fraction and heavy reformate. Heavy reformate with a high octane number and low benzene content (less than 1%) will be sent to gasoline compounding or to the aromatic hydrocarbon complex, while light reformate will be sent to the pentane distillation column of the naphtha splitter with subsequent separation into fractions $C_5$ and $C_6$. The following installations will be available at the oil refinery and at the aromatic hydrocarbon complex:

- Amine washing and amine solution regeneration;
- Sulfur manufacturing plants (which in the future will be part of the integrated oil processing plant);
- Acidic effluent steaming installation;
- Hydrogen plant (hydrogen production by steam reforming).

To improve the economic efficiency of the new facilities it has been decided to add also an installation for manufacture of base oils. Alternative 6 was selected.

It will be able to process heavy crude oil with a high sulfur content. It will produce high-value products, such as diesel fuel meeting the EU norms, kerosene, high-octane gasoline.
4.3 ANALYSIS OF THE ZERO ALTERNATIVE, I.E. NO CONSTRUCTION OF THE COMPLEX. ADVANTAGES OF THE CONSTRUCTION OF THE COMPLEX

The oil, gas and petrochemical sector in the Republic of Tatarstan is a central sector of the economy making a substantial contribution to the regional budget, the RT gross domestic product and the development of small businesses associated with this sector.


Successful implementation of the Development Program of the oil, gas and chemical sectors of the RT for 2004-2008 approved by the RT Cabinet of Ministers on 02.04.2004 including the construction of an oil refinery will allow this region to significantly increase its contribution to the RF gross domestic product.

The selected oil processing technology for the Complex will allow for the processing of 100% of Carboniferous oils, 100% of Devon oil or a mix of both at any ratio and the Stage 1 facilities will permit the processing of a mix of 75% of Devon oil and 25% of Carboniferous oil.

Processing of 100% of high-sulfur Carboniferous oil is of strategic importance for Russia, and the availability of a number of petrochemical facilities will enable Tatarstan to manufacture some commercial products, for which high demand has been forecasted for the near future.

The implementation of the Complex is one of the top-priorities for the development of the petrochemical sector both in the Republic of Tatarstan and the Russian Federation. It is aimed at achievement of the following objectives:

- Supply of fuel and energy resources and petrochemical products for the Republic of Tatarstan on the basis of the hydrocarbon resources available in this region;
- Processing of heavy high-sulfur oil, which is in line with the strategic objective of Russia, i.e. reduction in the proportion of high-sulfur crude oil in the export pipelines;
- Export of high-quality oil products instead of crude oil;
- Improvement of the environmental situation as a result of the use of clean fuels and compliance with the stringent requirements regarding emissions from the planned facilities;
- Use of 25 state-of-the-art proven technologies available worldwide;
- Self-sufficiency with respect to electricity supply due to electricity generation at the Company’s own facilities;
- Integration of oil refining and petrochemical facilities.
The organization of production of engine fuels and petrochemical products in the Nizhnekamsk District, requires raw material resources, labor resources and well developed infrastructure. The location of the planned facilities within the Nizhnekamsk Industrial Zone will permit a significant reduction in transportation cost for raw materials and energy supplies from other areas and an increase in the degree of integrated utilization of hydrocarbon resources.

The construction and operation of Stage 1 and later on of Stage 2&3 will have a positive effect on the socioeconomic situation in the region due to creation of new jobs for local residents currently employed predominantly in the petrochemical sector.

An improvement of the environmental situation within the area adjacent to the TANECO facilities will be achieved by reducing air emissions in the process of their operation. Following measures will be taken:

- The sulfur content of products will be reduced resulting in a decrease in SO$_2$ emissions in the atmosphere.
- NO$_x$ emissions to air will be decreased thanks to the denitrification of raw materials and ammonia decomposition to obtain final products with lower nitrogen contents. NO$_x$ reduction from the oil refinery due to the use of cleaner fuel in direct-fired furnaces and the use of burners with lower level of NO$_x$ generation in all furnaces will contribute to the overall substantial decrease in the air emissions from the oil refinery.
- SO$_2$ emissions from the oil refinery will be reduced due to the use of cleaner fuel in direct-fired furnaces.
- Emissions of other pollutants will be also reduced to a significant degree, including such pollutants as carbon monoxide and particulate matter, due to the use of cleaner fuels and improved maintenance and operation techniques.
- The load on the wastewater treatment facilities and H$_2$S emissions to the atmosphere will be reduced due to the use of an installation for acidic effluent steaming to remove H$_2$S and NH$_3$ from process condensate, which will permit re-use of the bulk of the process water.
- The Complex will incorporate a dust recovery and off-gas treatment system with intra-circuit gasification (IGCC), which will ensure recovery of all sulfur contained in coke or bitumen.
- Coke or bitumen to be sent to gasification will be subjected to removal of heavy metals.

One of the important advantages of the project will be the production of environmentally “cleaner” oil products for sale both in the domestic and export markets: diesel fuel (Euro-5 standards), gasoline of AI-95 and AI-98 grades (Euro-5 standard). It is planned to start diesel fuel production after completion of Stage 1 and AI-95 and AI-98 gasoline production after the completion of Stages 2 and 3.

According to the 2006 data, the vehicle exhaust gas emissions on average for Russia account for 40% to 45% of all emissions to the atmosphere. This fact demonstrates the importance of use of environmentally cleaner fuels complying with the Euro-4 Standard adopted in the EU since 2005 and the
Euro-5 Standard to become effective in the EU in 2009 for trucks (Euro-5 standard for cars being currently developed). In February 2008 the RF Government approved the Technical Regulation “On Requirements to Vehicle and Aviation Gasoline, Diesel Fuel, Vessel Fuel, Jet Fuel and Fuel Oil”, according to which low-octane gasoline grades will be not used anymore in Russia in three years and starting from 2013 only fuels complying with the Euro-5 standard will be produced in Russia (currently this Regulation is withheld according to RF Government Regulation no.712 dated 25.09.08).

As an example, a number of studies conducted in the city of Perm located near the Kama river in the Perm Region (about 400 km North-East from Nizhnekamsk) -where the vehicle exhaust emissions account for over 50% of atmospheric pollution- included measurements of the exhaust gas composition, assessment of the structure and intensity of traffic streams in the city and associated computations for assessment of risks for public health, caused by air pollution with sulfur dioxide and benzene currently and in the future after conversion of 50% and 90% of vehicles to environmentally cleaner fuel.

As a result of the assessment of the air pollution in the city of Perm with benzene and sulfur dioxide caused by the street traffic (about 97% of the traffic network was assessed), it was found that the use of currently available diesel fuel and gasoline grade in combination with the traffic pattern structure and intensity in the city results in a hazard coefficient with respect to sulfur dioxide in the order of 4.5 to 5.5. A hazard coefficient (HQ, risk criterion, the accepted level is 1.0) in relation to sulfur exceeding 1.0 was recorded in the vicinity of 35% of main streets and roads, where the traffic stream includes trucks. With the current traffic intensity and structure, an high level of risk of benzene impact near main streets and roads (within 5m to 40m from the road center line) was recorded for 40% of the traffic network. The hazardous coefficient varied from 1.1 to 5.8.

The use of about 50% of new fuel types within the city outlines will permit a reduction in the HQ value by a factor of 1.4 to 1.5 for sulfur dioxide and 1.8 to 2.2 for benzene. The use of 90% of new fuel types will result in a decrease in the HQ coefficient by 7 to 8 times for sulfur dioxide and 5.5 to 6.5 times for benzene (with the traffic intensity being the same).

The figures below are given as an example of the results of risk assessment of atmospheric air pollution with benzene emissions and the impact of different fuel compositions on public health in the central part of the city of Perm.
Figure 4.3-1. Significant impact on public health as a result of atmospheric air pollution with benzene as a component of exhaust gas from vehicles (the existing situation)

Figure 4.3-2. Reduced impact on public health as a result of atmospheric air pollution with benzene as a component of exhaust gas from vehicles (50% of fuels of Euro-4 standards)
Along with a risk reduction for public health and its economic effect, the implementation of the Stage 1 will resolve one of the top-priority issues of the RF which is the introduction of environmentally cleaner fuels and the development of facilities in the RF capable of producing such fuel types. The development of the Oil Refinery will ensure processing of 7 million tonnes of high-sulfur oil per year.

Figure 4.3-3. Limited impact on public health as a result of atmospheric air pollution with benzene as a component of exhaust gas from vehicles (90% of fuels of Euro-4 standards)
This chapter contains discussion of issues on environmental and social impact assessment of Stage 1 during construction and operation phases and measures for avoidance, prevention, minimization and mitigation of any potential adverse impacts resulting from the Project implementation.

5.1 IMPACTS ON ATMOSPHERIC AIR QUALITY

5.1.1 Atmospheric Air Quality

Methodology
The implementation of projects which add new sources of pollutants emissions require an assessment and quantitative determination of their impact on the atmospheric air quality.

The existing methodological approaches for the calculation and modeling of changes in the pollutants concentrations in atmospheric air permit determination of environmental impacts from new sources.

As a general guideline the World Bank proposes to carry out such impact assessment for facilities, which can potentially release annually over 500 t of sulfur dioxide (SO$_2$) or nitrogen oxides (NO$_x$) or 50 t of solid particles or any other hazardous pollutants.

According to the Russian methodological guidelines OND-86 “Method for calculating concentrations of harmful substances in atmospheric air released with air emissions from industrial enterprises”, calculations should be made for those pollutants, for which:

\[
\frac{M}{MPC} > \Phi;
\]

where \( \Phi \) is a factor determined by the height of an emission source and the emission intensity. Normally, \( \Phi \) is assumed to be 0.01,

\( M \) (g/s) is the total value of emissions from all sources at a given industrial enterprise corresponding to least favorable identified emission conditions, including also ventilation sources and fugitive emissions,

\( MPC \) (mg/m$^3$) is the instantaneous maximum permissible concentration.

A more detailed description of the methods for the assessment of emissions of pollutants in the atmosphere is given in Section 5.1.6.

5.1.2 Legislative and Other Requirements for the Air Quality
5.1.2.1 International Requirements and Obligations of the RF

The Russian Federation ratified the Vienna Convention on Protection of the Ozone Layer (Vienna, 1985); the objective of the Vienna Convention is to protect public health and environment against deleterious changes in the ozone layer.

The Montreal Protocol on ozone-depleting substances regulating a reduction in the use of Freon refrigerants by 2010 was also ratified by the RF.


The main obligation of the RF in accordance with the Kyoto Protocol is to keep the average emissions levels in 2008-2012 at the 1990 level.

5.1.2.2 Legislative Requirements and Regulatory Norms in the RF

The Federal Law “On Atmospheric Air Protection”, No.96-FZ of 04.05.1999 (Revision of 31.12.2005) lays down the legal principles of atmospheric air protection, including the requirements set for air protection in the process of different types of industrial operations.

According to Article 16 of the Law, in the course of planning, site selection of any facilities for commercial and other activities it is required to ensure compliance with the atmospheric air quality norms in conformity with the relevant environmental, sanitary and hygienic norms and rules.

In order to protect atmospheric air in residential areas, sanitary protection zones are to be established for industrial enterprises (groups of enterprises). The regulatory dimensions of a sanitary protection zone are determined on the basis of calculation of dispersion of pollutants in atmospheric air and in accordance with the sanitary classification of enterprises.

According to Par.2.4, “a united calculated and finally established sanitary protection zone is to be defined for a group of industrial enterprises and facilities or an industrial zone (complex) taking into account the overall emissions in the atmosphere and physical impact sources of the industrial facilities and operations, included in the united zone”.

A construction project design of facilities for commercial and other types of operations, which can have adverse impact on the atmospheric air quality, should provide for measures aimed at reducing harmful emissions in the atmosphere and their decontamination.

The Sanitary Epidemiological Rules and Norms SanPiN 2.1.6.1032-01 “Hygienic Requirements to Ambient Air Quality in Residential Areas” specify compulsory hygienic requirements to be met in the process of planning, construction, upgrading (technical modernization) and operation of industrial facilities, as well as during all stages of development of urban development documentation, in order to ensure adequate ambient air quality and compliance with hygienic norms.
According to SanPiN 2.1.6.1032-01, the regulation of atmospheric air quality in residential areas is based on the hygienic norms specifying the maximum permissible concentrations of chemical and biological pollutants in atmospheric air. The compliance with the MPC levels prevents direct or indirect impact on public health and living conditions; the concentrations of some specific pollutants are prescribed in the Safe Reference Levels of Impact, for which a certain timeframe is set.

The Hygienic Norm GN 2.1.6.1338-03 “Maximum Permissible Concentrates of Pollutants in Atmospheric Air in Residential Areas” specifies the instantaneous and average daily MPC values of pollutants and safe reference levels of impact in the ambient air in residential areas, which must be complied with at the boundary of the sanitary protection zone of an enterprise.

MPC values and reference concentrations of main pollutants in ambient air in residential areas\(^{20}\), recommended by the WHO and in the respective Russian regulatory documents are given below (Table 5.1-1).

### Table 5.1-1.

<table>
<thead>
<tr>
<th>Pollutants (mg/m(^3))</th>
<th>Requirements of standards</th>
<th>ARFC(^{21})</th>
<th>RFc(^{22})</th>
<th>Russian Norms (MPC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Maximum instantaneous concentration</td>
<td>Average daily concentration</td>
<td></td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td></td>
<td>0.47</td>
<td>0.04</td>
<td>0.2</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td></td>
<td>0.66</td>
<td>0.05</td>
<td>0.5</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td></td>
<td>-</td>
<td>0.05</td>
<td>0.008</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td></td>
<td>23.0</td>
<td>3.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Particulate matter</td>
<td></td>
<td>0.30</td>
<td>0.075</td>
<td>0.5</td>
</tr>
<tr>
<td>Phenol</td>
<td></td>
<td>6</td>
<td>0.006</td>
<td>0.010</td>
</tr>
<tr>
<td>Ammonia</td>
<td></td>
<td>0.35</td>
<td>0.1</td>
<td>0.200</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td></td>
<td>0.048</td>
<td>0.003</td>
<td>0.035</td>
</tr>
<tr>
<td>Hydrocarbons C(<em>1)–C(</em>{10})</td>
<td></td>
<td>-</td>
<td>-</td>
<td>50</td>
</tr>
</tbody>
</table>

* The figures marked with color indicate more stringent norms in comparison with the MPC values.

---

\(^{20}\) According to R 2.1.10.1920-04. “Guidelines for assessing risk for public health in case of exposure to chemicals polluting the environment”.

\(^{21}\) ARFC is a reference concentration as a criterion for assessment of acute inhalation impacts recommended by the international community and the Russian regulatory documents for risk assessment. It characterizes periods from 20 minutes up to 2 hours.

\(^{22}\) RFc is a reference concentration as a criterion for assessment of daily exposure to a chemical during the entire life period, which is determined on the basis of all currently available scientific data and which probably does not cause any unacceptable risk for human health for sensitive groups of population.
5.1.2.3 Requirements of International Financial Institutions, European Union, World Health Organization to Air Emission Sources and Atmospheric Air Quality

Comparative characteristics of the applicable requirements of international financial institutions, including the World Bank Group, the European Union and the World Health Organization for the ambient air quality and for air emission sources are given in Tables 5.1-2 and 5.1-3, respectively.

The general recommendation of the World Bank and the EU Directives relating to the values of permissible concentrations of common pollutants in atmospheric air are based on the recommendations of the World Health Organization.

The requirements to air emission sources are based on the concentrations recommended by the World Bank, which may be reached during 95% of the period of operation of the TANECO facility. It should be pointed out that these recommendations do not refer to any specific sources (equipment), but the structure of the IFC’s EHS Guidelines (2007) implies division by industry sectors (see Table 5.1-3).

Table 5.1-2. Regulatory average concentrations of common pollutants in ambient air in residential areas according to the WHO and EU recommendations for different periods

<table>
<thead>
<tr>
<th>Pollutants (mg/m³)</th>
<th>WHO 23</th>
<th>EU DA 24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 hour</td>
<td>24 hours</td>
</tr>
<tr>
<td>Nitrogen dioxide NO₂</td>
<td>0.2</td>
<td>-</td>
</tr>
<tr>
<td>Sulfur dioxide SO₂</td>
<td>0.5 – for 10 min</td>
<td>0.02</td>
</tr>
<tr>
<td>Carbon monoxide CO</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Particulate Matter:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- PM₂₅</td>
<td>-</td>
<td>0.025</td>
</tr>
<tr>
<td>- PM₁₀</td>
<td>-</td>
<td>0.050</td>
</tr>
<tr>
<td>Ozone O₃</td>
<td>0.1 – for 8 hours</td>
<td>-</td>
</tr>
</tbody>
</table>

A comparative analysis has indicated that the EU Directive specifies more stringent requirements to atmospheric air than the WHO Guidelines.

---


**Table 5.1-3. Requirements of Standards of the World Bank Group to Air Emissions in Corresponding Sectors of Industry**

<table>
<thead>
<tr>
<th>Description of standards</th>
<th>IFC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PPCOC</td>
</tr>
<tr>
<td>Emissions to atmospheric air, mg/m³</td>
<td></td>
</tr>
<tr>
<td>Particulate matter</td>
<td>20</td>
</tr>
<tr>
<td>Nitrogen oxides</td>
<td>300</td>
</tr>
<tr>
<td>Hydrochloride</td>
<td>10</td>
</tr>
<tr>
<td>Sulfur oxides</td>
<td>100</td>
</tr>
<tr>
<td>1,2-dichloroethane</td>
<td>5</td>
</tr>
<tr>
<td>Vinyl chloride</td>
<td>5</td>
</tr>
<tr>
<td>Acrylnitrile</td>
<td>0.5 (combustion), 2 (gas treatment) 5 (15 – for drying chambers)</td>
</tr>
<tr>
<td>Ammonia</td>
<td>15</td>
</tr>
<tr>
<td>Volatile organic compounds (VOC)</td>
<td>20</td>
</tr>
<tr>
<td>Heavy metals (total content)</td>
<td>1.5</td>
</tr>
<tr>
<td>Mercury and its compounds</td>
<td>0.2</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>0.15</td>
</tr>
<tr>
<td>Ethylene</td>
<td>150</td>
</tr>
<tr>
<td>Ethylene oxide</td>
<td>2</td>
</tr>
<tr>
<td>Hydrocyanide</td>
<td>2</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>5</td>
</tr>
<tr>
<td>Nitrobenzene</td>
<td>5</td>
</tr>
<tr>
<td>Organic sulfides and mercaptans</td>
<td>2</td>
</tr>
<tr>
<td>Phenols, creosols and xylenes (such as phenol)</td>
<td>10</td>
</tr>
<tr>
<td>Benzene</td>
<td>5</td>
</tr>
<tr>
<td>Caprolactam</td>
<td>0.1</td>
</tr>
<tr>
<td>Dioxins (furans)</td>
<td>0.1 (ng of toxic) 0.1 (ng of total)</td>
</tr>
</tbody>
</table>

---

22 EHS Guidelines for production of petroleum-containing polymers, 30 April 2007 (International Financial Corporation, World Bank Group)
23 EHS Guidelines for oil refineries, 30 April 2007 (International Financial Corporation, World Bank Group)
### Air Emission Sources

#### During Construction of Stage 1 facilities

During the construction of Stage 1 in the Nizhnekamsk Industrial Zone, including the water pipeline for industrial water supply and sewer line for release of treated wastewater to the Kama River, as well as the loading dock chamber at the Kama River, there will be the following sources of air pollutants:

- Internal combustion engines of construction machinery;
- Hoisting mechanisms;
- Vehicles and railroad transport;
- Welding and drying equipment on construction sites;
- Gas cutting stations;
- Unloading and storage of inert materials (crushed stone, sand);
- Dust from the ground surface disturbed by earthmoving operations during warm season.

Welding work will emit manganese dioxide and welding aerosol emissions; transport vehicles and construction machinery release exhaust gas consisting of numerous components divided into several groups based on similar impact on environment and human health or qualitatively similar in relation to their chemical structure and properties:

- Non-toxic substances: nitrogen, oxygen, hydrogen, water vapor and carbon dioxide;
- Carbon monoxide, the presence of which in large amounts (up to 12%) is characteristic of exhaust gas from internal combustion engines using gasoline;
- Nitrogen oxides;
- Hydrocarbons, aromatic compounds, including carcinogen;
- Spent gas components: aldehydes.

Loose bulk materials will be delivered to the construction site by trucks or by railroad, covered with tarpaulin to prevent release of dust into the air. During unloading of loose materials they will be sprayed with water to eliminate any dust. Sand and crushed stone will be stored in special areas under shelter and covered with tarpaulin. This means that loose materials will not be a source of atmospheric pollution.
To prevent dust transfer from areas of earthmoving operations during warm season, the disturbed soil surface will be sprayed with water on a regular basis.

5.1.3.2 During Operation of Stage 1 facilities

The main sources of pollutants emissions in the air from Stage 1 operation will be:

- Technological furnaces, flare facilities, transport vehicles and railroad transport (nitrogen oxides, carbon monoxide and sulfur dioxide);
- Sealing elements of movable and stationary connections of process equipment, pipelines, valves, devices for loading of petroleum products into transport means, surfaces of wastewater treatment facilities, etc. (hydrocarbons);
- Wastewater treatment facilities, water supply systems, process equipment of main production facilities, tank farms and pump stations (hydrogen sulfide).

The Project will also include some major infrastructure facilities, which will be located within the Nizhnekamsk Industrial Zone and at the Kama River:

- Receiving station of the trunk oil pipeline from pump station “Kaleikino” to the TANECO Complex;
- Head pumping station “Nizhnekamsk-II” of the trunk pipeline for petroleum products Nizhnekamsk – Almetyevsk – Kstovo;
- Railroad station ‘Predkominatskaya’ comprising two depots for reception and marshalling yards, technical and service buildings, track facilities, locomotive and railroad car depots, railroad car washing station;
- Railroad station ‘Tungucha’;
- Railroad tracks connecting the station ‘Predkominatskaya’ with the TANECO Complex.

These infrastructures will be built for Stage 1 by RZhD and RosEnergo.

Some infrastructure facilities, namely the oil pump station of the oil pipeline “Kaleykino” – TANECO Complex and the pump stations of the trunk pipeline for petroleum products Nizhnekamsk – Almetyevsk – Kstovo (with an exception of the head pumping station “Nizhnekamsk-II”) are located outside of the industrial zone of the city of Nizhnekamsk, i.e. outside of the zone of air emission sources of the Nizhnekamsk Industrial Zone However the development and environmental monitoring of these infrastructures are under the responsibility of RosEnergo and hence were not considered in this report to determine pollutant emission release in the air.

The following sources of air emissions during the operation of railroad facilities have been identified:

- Engines of yard locomotives that, when running in idle mode or during train arranging and other operations, will release nitrogen oxides, carbon monoxide, sulfur dioxide, carbon black and kerosene;
• Workshops involved in repairs and maintenance of locomotives and railroad cars (metal machining, woodworking, welding operations, repairs and testing of fuel equipment, washing of components, oil replacement, filling of locomotives with fuel and loading of sand into locomotives’ bins). The following pollutants will be released into the air: iron oxide, abrasive dust, nitrogen dioxide, manganese and its compounds, inorganic dust, carbon monoxide, gaseous fluorides, hexavalent chromium, wooden dust, kerosene, hydrogen sulfide, saturated hydrocarbons C_{12}-C_{19}, inert mineral oil;

• Rheostat testing area located at the site and used for running-in of locomotive engines after repair. The following pollutants will be released to air during engine operation: nitrogen oxides, sulfur dioxide, carbon monoxide, carbon black and kerosene;

• Railroad car steaming area. Railroad tank cars will be washed and steamed to remove petroleum hydrocarbons. In the process of washing, steaming and degassing of railroad tank cars and as a result of oily sludge discharge and storage the following pollutants will be released into air: benzene, xylene, saturated hydrocarbons C_6-C_{10}, C_{12}-C_{19};

• Fuel depot comprising two semi-buried storage tanks of 100m³ capacity each. Hydrogen sulfide and saturated hydrocarbons C_{12}-C_{19} will be released into air via breather valves in the process of diesel fuel unloading and storage;

• Tower store for sand required for locomotives. Inorganic dust will be released to air within the adjacent areas in the process of sand unloading and loading;

• Engines of transport vehicles. A garage will be constructed for cars and transport vehicles and buses. Engines will release in the process of start-up, warming-up and operation in idle mode such pollutants as nitrogen oxides, sulfur dioxide, carbon monoxide, carbon black, gasoline and kerosene.

At the crude oil reception station of the oil pipeline there will be the following air emission sources:

• Equipment of pump stations;

• Scraper receivers and launchers;

• Filters / mud collectors;

• Pressure regulators;

• Safety valve assemblies;

• Oil metering station with pipe-and-piston calibration devices;

• Tanks for petroleum discharge and drainage vessels.

Atmospheric air pollution will be also caused by operating process equipment due to imperfect sealing of shut-off and regulating valves, gaskets and end seals, drainage devices. The following pollutants will be released: saturated hydrocarbons C_1-C_5, C_6-C_{10}, amilenes, benzene, xylene, toluene, hydrogen sulfide, saturated hydrocarbons and mineral oil.
When the loading dock chamber tugboat will be operating and push towboat will be used, they will emit exhaust gas to air.

The Stage 1 facilities itself and the associated off-site facilities will emit 79 types of pollutants to the atmosphere; 15 types of pollutants mixtures will be formed in the atmosphere, which have specific toxic effects.

Accidental and one-time releases of pollutants into the atmosphere from flare facilities will take place during emergency shutdown of technological installations requiring emptying of the process equipment and discharge of the gaseous and liquid phases to the flare system and drainage tanks, respectively.

Under normal operating conditions, emissions from the flare facilities will be minimal. The flare systems will use flushing gas in stand-by mode.

The overall predicted accidental release of pollutants to air from the Stage 1 facilities has been estimated at 4,550.8 t/year.

### 5.1.4 Impacts on the Quality of Atmospheric Air

#### 5.1.4.1 Impacts on Atmospheric Air Quality during Construction Phase of the Oil Refinery

During the construction phase, air emissions will be caused only by operating internal combustion engines of construction machinery and vehicles, welding and painting operations. It is also possible that some dusting might be caused by wind during warm season from ground surfaces temporarily disturbed in the process of earthmoving operations.

A list of pollutants, which will be released in the course of construction of the Stage 1 facilities, is presented in Table 5.1.-4 with indication of emission sources contributions to the overall air emissions.

An analysis of the pollutants dispersion calculations has indicated that the impact of air emissions during the construction phase will be insignificant.

**Table 5.1-4. Contributions of air emission sources to atmospheric air pollution during the Stage 1 construction phase**

<table>
<thead>
<tr>
<th>Pollutants/ Summation groups</th>
<th>Code</th>
<th>Description</th>
<th>MPC (instantaneous / average daily)/ SRLI</th>
<th>Hazard Class</th>
<th>Maximum concentrations of pollutants, proportion of MPC</th>
<th>Comment (residential area)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>SPZ boundary</td>
<td>Residential area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0123 Iron oxide</td>
<td>0143</td>
<td>Manganese and its compounds</td>
<td>0.01/- /-</td>
<td>2</td>
<td>0.05 /- /-</td>
<td>Ishteryakovo</td>
</tr>
<tr>
<td>0301 Nitrogen dioxide</td>
<td>0328</td>
<td>Carbon black</td>
<td>0.015/- /-</td>
<td>3</td>
<td>0.01 /- /-</td>
<td>Ishteryakovo</td>
</tr>
<tr>
<td>0330 Sulfur dioxide</td>
<td>0337</td>
<td>Carbon monoxide</td>
<td>0.5/- /-</td>
<td>3</td>
<td>0.00 /- /-</td>
<td>Ishteryakovo</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Pollutants/</td>
<td>Summation groups</td>
<td>MPC (instantaneous/average daily)/SRLI</td>
<td>Hazard Class</td>
<td>Maximum concentrations of pollutants, proportion of MPC</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------------</td>
<td>-----------------------------------</td>
<td>--------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>0342</td>
<td>Fluorides (gaseous)</td>
<td>0.02/-/-</td>
<td>2</td>
<td>0.01</td>
<td>0.00</td>
<td>Ishteryakovo</td>
</tr>
<tr>
<td>0343</td>
<td>Readily soluble fluorides</td>
<td>0.03/-/-</td>
<td>2</td>
<td>0.01</td>
<td>0.00</td>
<td>-</td>
</tr>
<tr>
<td>0616</td>
<td>Xylene</td>
<td>0.2/-/-</td>
<td>3</td>
<td>0.46</td>
<td>0.15</td>
<td>-</td>
</tr>
<tr>
<td>0621</td>
<td>Methylbenzene (toluene)</td>
<td>-</td>
<td>-</td>
<td>0.00</td>
<td>0.00</td>
<td>Ishteryakovo</td>
</tr>
<tr>
<td>1042</td>
<td>n-Butyl Alcohol</td>
<td>0.1/7/-</td>
<td>3</td>
<td>0.36</td>
<td>0.12</td>
<td>Ishteryakovo</td>
</tr>
<tr>
<td>1061</td>
<td>Ethanol</td>
<td>5/-/-</td>
<td>4</td>
<td>0.01</td>
<td>0.00</td>
<td>Ishteryakovo</td>
</tr>
<tr>
<td>1078</td>
<td>Ethylene glycol</td>
<td>771.0</td>
<td>-</td>
<td>0.00</td>
<td>0.00</td>
<td>-</td>
</tr>
<tr>
<td>1112</td>
<td>Ethyl carbitol</td>
<td>770.5</td>
<td>-</td>
<td>0.00</td>
<td>0.00</td>
<td>-</td>
</tr>
<tr>
<td>1210</td>
<td>Butyl acetate</td>
<td>0.1/-/-</td>
<td>4</td>
<td>0.05</td>
<td>0.02</td>
<td>Ishteryakovo</td>
</tr>
<tr>
<td>1401</td>
<td>Acetone (Propane-2-on)</td>
<td>0.35/-/-</td>
<td>4</td>
<td>0.09</td>
<td>0.03</td>
<td>Ishteryakovo</td>
</tr>
<tr>
<td>2704</td>
<td>Petroleum gasoline</td>
<td>5.0/-/-</td>
<td>4</td>
<td>0.00</td>
<td>0.00</td>
<td>-</td>
</tr>
<tr>
<td>2732</td>
<td>Kerosene</td>
<td>771.2</td>
<td>-</td>
<td>0.00</td>
<td>0.00</td>
<td>-</td>
</tr>
<tr>
<td>2735</td>
<td>Mineral oil</td>
<td>-</td>
<td>-</td>
<td>0.16</td>
<td>0.05</td>
<td>Ishteryakovo</td>
</tr>
<tr>
<td>2752</td>
<td>White spirit</td>
<td>771.0</td>
<td>-</td>
<td>0.06</td>
<td>0.02</td>
<td>-</td>
</tr>
<tr>
<td>2908</td>
<td>Inorganic dust</td>
<td>0.3/-/-</td>
<td>3</td>
<td>0.00</td>
<td>0.00</td>
<td>-</td>
</tr>
</tbody>
</table>

**Summation groups**

<table>
<thead>
<tr>
<th>Code</th>
<th>Pollutants/</th>
<th>Summation groups</th>
<th>MPC (instantaneous/average daily)/SRLI</th>
<th>Hazard Class</th>
<th>Maximum concentrations of pollutants, proportion of MPC</th>
<th>Comment (residential area)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6009</td>
<td>(2) 301 330 (nitrogen dioxide, sulfur dioxide)</td>
<td>(2) 301 330</td>
<td>1</td>
<td>0.09</td>
<td>0.03</td>
<td>Ishteryakovo</td>
</tr>
<tr>
<td>6039</td>
<td>(2)330 342 (sulfur dioxide, gaseous fluoride)</td>
<td>(2)330 342</td>
<td>1</td>
<td>0.02</td>
<td>0.01</td>
<td>Ishteryakovo</td>
</tr>
<tr>
<td>6046</td>
<td>(2) 337 2908 (carbon monoxide, inorganic dust 20-70% SiO2)</td>
<td>(2) 337 2908</td>
<td>1</td>
<td>0.01</td>
<td>0.00</td>
<td>-</td>
</tr>
</tbody>
</table>

Based on the analysis of the pollutants dispersion calculations it may be concluded that during the construction phase the ground-level concentrations in case of most adverse weather conditions will be insignificant and limited to the site boundaries. Thus, the calculated ground-level concentrations of pollutants from individual emission sources during the construction phase do not exceed the Russian regulatory norms.

**Loading dock chamber on the Kama River**

The following air emission sources were taken into account when assessing the impact on atmospheric air quality during the construction phase:

- Welding work,
• Operation of construction machinery.

The total number of construction machinery (dump trucks, transport vehicles, bulldozers, excavators, loaders, self-propelled compaction rollers and concrete mixers) will be 40 units. The duration period during which this machinery will be operated will be 3 to 8 months.

The total amount of pollutants (nitrogen oxides, sulfur dioxide, carbon, iron oxide, manganese dioxide, fluorides, carbon monoxide and SiO$_2$-containing dust) will not exceed 8.41 t during the entire construction period.

No integrated calculation of pollutants dispersion in the atmosphere during the construction phase (including construction of off-site infrastructure facilities) has been made, because the zone impacted by each of the emission sources (Stage 1 itself, trunk oil pipelines, petroleum product pipeline, off-site railroad facilities, loading dock chamber on the Kama River) is strictly local and limited to the respective industrial site, without affecting the adjacent areas and facilities.

5.1.4.2 Expected Impacts on the Air Quality during Operation Phase of Stage 1

Assessment of the impact of the Oil Refinery on atmospheric air quality during the operation phase was made on the basis of the methodological procedure set forth in OND-86 “Method for the calculation of concentrations of pollutants released with air emissions from industrial enterprises in atmospheric air” developed for the calculation of ground-level concentrations of pollutants within a 2m high air layer above the ground level and vertical distribution of concentrations.

A more detailed description of this procedure and its comparison with other methods are given in Section 5.1.4.3.

An assessment of the potential impact on atmospheric air quality included the following:

• Selection of a model and a method of calculation for pollutants dispersion in the atmosphere;
• Analysis of short-term atmospheric air pollution from emissions sources of the Stage 1 facilities;
• Analysis of long-term atmospheric air pollution from emissions sources of the Stage 1 facilities;
• Analysis of risks for public health in the nearby residential areas within the zone impacted by the given facilities.
5.1.4.3  Models and methods for pollution dispersion calculations

The OND-86 methodological guidelines are the basic document applicable in the RF and in other CIS countries for the calculation of atmospheric air pollution in the process of design development for industrial projects. The method is based on theoretical and experimental studies of regularities of pollutants dispersion in the atmosphere. A specific feature of the developed atmospheric diffusion models is the use of a formal apparatus of geophysical hydrodynamics, and in particular, joint solution of equations of thermodynamics of the boundary layer of the atmosphere and turbulent diffusion equations.

The developed models are applicable within a range of up to 50-100 km from emission sources.

Along with such methods there are also some Gaussian model versions, which are normally used for computation of atmospheric air pollution at a local scale (up to 10-20 km from emission sources).

For example, the CALPUFF safety method is widely used in the USA to calculate pollutants dispersion; it is based on a Lagrangian analysis modeling transfer of pollutants in an air stream along trajectories of emitted particles and gas puffs. This model permits the user to vary the averaging period, but the application of this method under the current conditions in Russia in the absence of actual basic data for calculations in relation to an extensive range of meteorological parameters and characteristics of underlying terrain would result in significant calculation errors.

It should be pointed out that the OND-86 model permits calculation of maximum concentrations with only one averaging period equal to 20-30 minutes. Due to this reason, a model has been developed in Russia for the calculation of average annual (or basically any long-term periods) concentrations based on the same principles and methodology as the OND-86. If the maximum concentrations $C_{t_1}$ and $C_{t_2}$ corresponding to the respective periods of $t_1$ and $t_2$ are known, then the following relation between them exists, according to numerous experimental studies:

$$C_{t_1}/C_{t_2} = (t_2/t_1)^p. \quad (1)$$

The value of the power exponent, $p$, can be determined by the formula:

$$p = \ln (C_{t_1}/C_{t_2}) / \ln (t_2/t_1) \quad (2)$$

The resulting value of $p$ can be used for assessing the concentration $C_t$ corresponding to “intermediate” averaging periods of $t$ (i.e. satisfying the inequality $t_1 < t < t_2$). To characterize the reliability of the model the average value of $p=0.15$ can be used. Taking this $p$ value the maximum one-time (20-minute periods) concentrations can be “re-calculated”, for example, to average daily or annual values.

Thus, for the purpose of these calculations, the OND-86 method was used to assess the maximum ground-level concentrations for a 20-minute averaging period and for subsequent re-calculation for average annual intervals.

Taking into account the fact that with an increase in the averaging time the maximum concentrations of pollutants decrease, it follows that if the maximum instantaneous concentrations corresponding to the 20-minute
averaging time do not exceed the regulatory norms for atmospheric air quality in relation to the averaging time of 1 hour or 24 hours, then the maximum concentrations in relation to the averaging time of 1 hour or 24 hours will reliably not exceed those norms. Due to this reason, in order to assess the impact of the planned facilities on the atmospheric air quality it is possible to eliminate calculations for averaging periods of 1 hour and 24 hours.

5.1.4.4 Calculation of Pollutants Dispersion in the Atmosphere for operation phase

For the purpose of this calculation, the short-term and long-term levels of air pollution from pollutants released from stationary sources of the Oil Refinery were assessed.

The prediction of air pollution was made with the help of a unified Russian standardized ‘Ecolog 3.0” software program for calculation of impurities dispersion based on mathematical models described and approved in the national regulatory document “Methodological guidelines for calculating concentrations of pollutants released with air emissions from industrial enterprises in atmospheric air “ (OND-86).

The estimation of the ground-level concentrations caused by emissions from the Stage 1 facilities was made in two stages:

- Preliminary calculations for all 79 types of pollutants, which can be released from stationary sources at the Stage 1 facilities, in order to select essential pollutants causing significant (i.e. over 0.001 MPC) ground-level concentrations;
- Calculations and selection of significant emission sources with respect to pollutants posing most deleterious impact on the environment and public health.

There are some villages and settlements located in the vicinity of the Nizhnekamsk Industrial Zone: Prosti to the north (4.5 km); Martysh (1550m) and Ishteryakovo (3650m) to the south; Avlash (4250m) and Nikoshnovka (4500m) to the south-east; Alan (1300m), orchards of Balchikly (4000m), settlement of Balchikly (5500m) and Klaytle (4200m) to south-west; Stroiteley (orchards) (2250m) to the west; and the residential zone of the city of Nizhnekamsk to the north-west.

Eleven points were selected for calculations in the settlements located within the zone affected by the TANECO facilities (as shown in Figure 5.1-1), at the boundary of the residential area close to the industrial zone, including three points in the city of Nizhnekamsk, the largest of the above residential areas. The meteorological characteristics and parameters determining pollutants dispersion in the atmosphere are given in Table 5.1-5.
The pollutants dispersion is calculated taking into account all air emission sources of the Stage 1 facilities (the list of facilities is given in Section 3.2) and associated infrastructure facilities located within the Nizhnekamsk Industrial Zone:

- Crude oil reception station of the trunk oil pipeline “NPS Kaleykino” – TANECO Complex;
- Head pump station “Nizhnekamsk-II” of the trunk pipeline for petroleum products Nizhnekamsk – Almetyevsk – Kstovo;
- Railroad station ‘Predkominatskaya’ comprising two depots for reception and marshalling yards, technical and service buildings, track facilities, locomotive and railroad car depots, railroad car washing station;
- Railroad station ‘Tungucha’;
- Railroad tracks connecting the station ‘Predkominatskaya’ with the TANECO Complex.

An assessment of potential air pollution and atmospheric air quality was made with due consideration of the baseline concentrations of pollutants using the data of the territorial department of hydrometeorology and environmental monitoring (UGMS) and on the basis of calculations of pollutants dissipation from all existing emission sources in the Nizhnekamsk Industrial Zone for substances, the baseline concentrations of which were unknown.

Table 5.1-6 contains a comparison of the calculated baseline data and actual monitoring data.
Table 5.1-6. Comparison of the actual background data (obtained by in-situ measurements) and calculated air pollution levels\(^{28}\) (for the selected essential pollutants released by the Oil Refinery and other priority pollutants with high baseline concentrations)

<table>
<thead>
<tr>
<th>Description of pollutants</th>
<th>MPC (max. one-time values)</th>
<th>Baseline concentrations, proportion of MPC value (maximum instantaneous concentrations)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>UGMS Data (calm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Calculated baseline values (not taking into account exhaust from vehicles)</td>
</tr>
<tr>
<td>Particulate matter</td>
<td>0.500</td>
<td>0.422</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>0.500</td>
<td>0.013</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>5.000</td>
<td>0.396</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>0.200</td>
<td>0.340</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>0.008</td>
<td>0.656</td>
</tr>
<tr>
<td>Phenol</td>
<td>0.01</td>
<td>0.6915</td>
</tr>
<tr>
<td>Ammonia</td>
<td>0.200</td>
<td>0.315</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>0.035</td>
<td>1.00</td>
</tr>
</tbody>
</table>

A positive feature of the field measurement data is its high reliability, but the list of pollutants monitored with the aid of field measurements accounts only for approximately 10% of all pollutants.

An advantage of the background calculations is the possibility to obtain data for the entire range of pollutants, but the level of confidence in relation to such data is not as high as in the case of field measurements.

Due to this reason, the worst possible scenario was used for the analysis of impacts of pollutants released from the Oil Refinery, i.e., the analysis was made based on calculated maximum baseline concentrations of pollutants.

Calculation of the potential maximum air pollution from Stage 1 facilities

We calculated the potential maximum air pollution using the Russian norms, i.e. taking into account the Maximum Permissible Concentrations for instantaneous (one-time) release, reference concentrations recommended by the World Health Organization as well as the integrated pollution index

\[ \text{IPI} = \sum \frac{C_i}{MPC_i} \]

for priority pollutants.

The data used for the analysis of pollution levels specified in the Russian regulatory documents and in the requirements of international organizations (for 9 possible pollutants) are given above in Table 5.1-1.

\(^{28}\) During ESIA process the following two ways of baseline concentration estimation has been used:

- the background concentrations calculated for each pollutant as statistically reliable maximum instantaneous concentrations, the values of which are exceeded in 5% of cases (in-situ measurements), characterize the atmospheric air pollution caused by other emission sources in the areas adjacent to the TANECO Complex site;
- the baseline concentrations calculated for each pollutant based on the parameters of present air emission sources of the Nizhnekamsk Industrial Zone.
Based on the first stage of calculations made for 79 pollutants, a set of pollutants was selected, with respect to which the TANECO facilities will make a significant contribution, i.e. over 0.001 MPC. The contribution of such pollutants to short-term concentrations at 11 representative points was assessed with due consideration of the baseline pollution level and the results of this assessment are given in Table 5.1-8.

The calculations were made taking into account 23 actions planned by two enterprises of the Nizhnekamsk Industrial Zone with the goal to reduce air emissions. The two authorized action plans for the OAO “NizhnekamskNeftekhim” and OAO “NizhnekamskShina” aimed to reduce air emissions are provided below in Table 5.1-7.

*Table 5.1-7. Expected air emission reduction from stationary emission sources of enterprises located within the Nizhnekamsk Industrial Zone as a result of implementation of 23 actions planned by OAO “NizhnekamskNeftekhim” and OAO “NizhnekamskShina”*

<table>
<thead>
<tr>
<th>Pollutants Code</th>
<th>Pollutants Description</th>
<th>Change in emission mass, t/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>101</td>
<td>Aluminium oxide</td>
<td>-52.0850</td>
</tr>
<tr>
<td>123</td>
<td>Iron oxide</td>
<td>-0.2480</td>
</tr>
<tr>
<td>143</td>
<td>Manganese and its compounds</td>
<td>-0.0550</td>
</tr>
<tr>
<td>164</td>
<td>Nickel oxide</td>
<td>-0.00004</td>
</tr>
<tr>
<td>203</td>
<td>Chromium trioxide</td>
<td>-0.1060</td>
</tr>
<tr>
<td>213</td>
<td>Iron oxide</td>
<td>-0.0070</td>
</tr>
<tr>
<td>254</td>
<td>Cyclopentadiene</td>
<td>-0.6700</td>
</tr>
<tr>
<td>301</td>
<td>Nitrogen dioxide</td>
<td>-119.4000</td>
</tr>
<tr>
<td>304</td>
<td>Nitrogen oxide</td>
<td>-19.4040</td>
</tr>
<tr>
<td>323</td>
<td>Silica</td>
<td>-7.8090</td>
</tr>
<tr>
<td>337</td>
<td>Carbon monoxide</td>
<td>-245.2000</td>
</tr>
<tr>
<td>408</td>
<td>Cyclohexane</td>
<td>-0.4252</td>
</tr>
<tr>
<td>409</td>
<td>Cyclopentane</td>
<td>-0.2490</td>
</tr>
<tr>
<td>410</td>
<td>Methane</td>
<td>-10.6150</td>
</tr>
<tr>
<td>412</td>
<td>Isobutane</td>
<td>-28.3926</td>
</tr>
<tr>
<td>415</td>
<td>Hydrocarbon mixture C1-C5</td>
<td>-69.7400</td>
</tr>
<tr>
<td>416</td>
<td>Hydrocarbon mixture C6-C10</td>
<td>-231.6040</td>
</tr>
<tr>
<td>501</td>
<td>Amilenes</td>
<td>-2.7540</td>
</tr>
<tr>
<td>502</td>
<td>Butylene</td>
<td>-19.9100</td>
</tr>
<tr>
<td>503</td>
<td>Divinyl</td>
<td>-5.0490</td>
</tr>
</tbody>
</table>

29 At the moment of air dispersion calculations in 2008, only these two enterprises did have authorised plans for air emission reduction.
<table>
<thead>
<tr>
<th>Code</th>
<th>Pollutants</th>
<th>Description</th>
<th>Change in emission mass, t/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>507</td>
<td>Hexen</td>
<td></td>
<td>-2.3260</td>
</tr>
<tr>
<td>514</td>
<td>Isobutylene</td>
<td></td>
<td>-12.7360</td>
</tr>
<tr>
<td>516</td>
<td>Isoprene</td>
<td></td>
<td>-3.2914</td>
</tr>
<tr>
<td>520</td>
<td>Piperilene</td>
<td></td>
<td>-4.3030</td>
</tr>
<tr>
<td>524</td>
<td>Cyclopentadiene</td>
<td></td>
<td>-0.6700</td>
</tr>
<tr>
<td>602</td>
<td>Benzene</td>
<td></td>
<td>-1.7660</td>
</tr>
<tr>
<td>615</td>
<td>Isoprene</td>
<td></td>
<td>-3.2928</td>
</tr>
<tr>
<td>616</td>
<td>Xylene</td>
<td></td>
<td>-0.0021</td>
</tr>
<tr>
<td>620</td>
<td>Styrene</td>
<td></td>
<td>-8.1294</td>
</tr>
<tr>
<td>621</td>
<td>Toluene</td>
<td></td>
<td>-0.9410</td>
</tr>
<tr>
<td>627</td>
<td>Ethylbenzene</td>
<td></td>
<td>-110.903</td>
</tr>
<tr>
<td>635</td>
<td>Alkylbenzene</td>
<td></td>
<td>-0.3136</td>
</tr>
<tr>
<td>708</td>
<td>Naphthalene</td>
<td></td>
<td>-0.0598</td>
</tr>
<tr>
<td>871</td>
<td>Chloromethane</td>
<td></td>
<td>-280.00</td>
</tr>
<tr>
<td>932</td>
<td>Chlororethane</td>
<td></td>
<td>-0.2018</td>
</tr>
<tr>
<td>1023</td>
<td>Diethylene glycol</td>
<td></td>
<td>-0.0074</td>
</tr>
<tr>
<td>1052</td>
<td>Methanol</td>
<td></td>
<td>-0.4806</td>
</tr>
<tr>
<td>1078</td>
<td>Ethylene glycol</td>
<td></td>
<td>-0.1754</td>
</tr>
<tr>
<td>1317</td>
<td>Acetaldehyde</td>
<td></td>
<td>-0.0400</td>
</tr>
<tr>
<td>1411</td>
<td>Cyclohexanol</td>
<td></td>
<td>-0.0840</td>
</tr>
<tr>
<td>1605</td>
<td>Morpholin</td>
<td></td>
<td>-0.0286</td>
</tr>
<tr>
<td>1607</td>
<td>Propylene oxide</td>
<td></td>
<td>-0.0002</td>
</tr>
<tr>
<td>2908</td>
<td>Inorganic dust containing 20% to 70% SiO2</td>
<td></td>
<td>-0.0012</td>
</tr>
<tr>
<td>2977</td>
<td>Talcum</td>
<td></td>
<td>-3.4091</td>
</tr>
</tbody>
</table>

TOTAL: -1246.8852
### Table 5.1-8. Maximum ground-level concentrations of the essential pollutants in ambient air in residential areas within the area impacted by the Stage 1 facilities

<table>
<thead>
<tr>
<th>Description of pollutants</th>
<th>Code</th>
<th>Calculated baseline concentration without Stage 1 facilities input, proportion of MPC (maximum instantaneous concentration)</th>
<th>Calculated Input into ground-level concentration caused by emission sources of Stage 1 facilities at the points selected for calculation (1-11), portion of MPC (maximum instantaneous concentration)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Iron oxide</td>
<td>123</td>
<td>0.0013</td>
<td>0.0001</td>
</tr>
<tr>
<td>Manganese and its compounds</td>
<td>143</td>
<td>0.012</td>
<td>5.2E-06</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>301</td>
<td>0.01</td>
<td>0.001</td>
</tr>
<tr>
<td>Carbon black</td>
<td>328</td>
<td>0.055</td>
<td>0.0000</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>330</td>
<td>0.229</td>
<td>0.0001</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>333</td>
<td>0.052</td>
<td>0.0039</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>337</td>
<td>0.003</td>
<td>0.0003</td>
</tr>
<tr>
<td>Readily soluble fluorides</td>
<td>343</td>
<td>0.000</td>
<td>0.00</td>
</tr>
<tr>
<td>Hydrocarbon mixture C1-C2</td>
<td>415</td>
<td>0.014</td>
<td>1.2E-06</td>
</tr>
<tr>
<td>Hydrocarbon mixture C6-C10</td>
<td>416</td>
<td>0.009</td>
<td>0.000</td>
</tr>
<tr>
<td>Pentilenes (amilenes)</td>
<td>501</td>
<td>0.024</td>
<td>2.7E-06</td>
</tr>
<tr>
<td>Benzene</td>
<td>602</td>
<td>0.058</td>
<td>0.0087</td>
</tr>
<tr>
<td>Xylene</td>
<td>616</td>
<td>0.020</td>
<td>0.0035</td>
</tr>
<tr>
<td>Toluene</td>
<td>321</td>
<td>0.032</td>
<td>0.000</td>
</tr>
<tr>
<td>Kersene</td>
<td>2732</td>
<td>0.009</td>
<td>0.002</td>
</tr>
<tr>
<td>IPI (Integrated Pollution Index)</td>
<td>1.375</td>
<td>0.021</td>
<td>0.127</td>
</tr>
</tbody>
</table>
As it can be seen from the data in Table 5.1-8, Stage 1 will not make a substantial contribution to the overall air pollution in the possible worst scenario and will not cause any non-compliance with the hygienic norms.

Most considerable change in the atmospheric air quality after commissioning of the Stage 1 facilities is expected in relation to the hydrogen sulfide concentration. The emission sources of the new facilities could cause a significant increase in hydrogen sulfide in ambient air in the settlement of Martysh (Point No.2) by 0.036 MPC and in the settlement of Ishteryakovo (Point No.4) by 0.027 MPC. Such an increase will not cause any non-compliance with the relevant hygienic norms even taking into account the high baseline concentrations.

For the most of other pollutants, an increase by maximum 0.02 MPC is expected on a short-term basis as a result of pollution from the emission sources of the Stage 1 facilities.

With respect to phenol and formaldehyde, which have the highest baseline concentration in the Nizhnekamsk Industrial Zone according to UGMS data (please see table 5-1-6), the emission sources of the Stage 1 facilities will not cause any increase in their concentration. Measures for reducing phenol and formaldehyde concentrations are discussed in Section 5.1.5.

In general, the emission sources of the new facilities will affect to a most significant degree the nearest residential areas: Martysh (contribution to the total air pollution assessed in terms of the integrated air pollution index will be 8.9%), Ishteryakovo (8.2%) and Alan (5.7%). As mentioned earlier in the report, the residents of Martysh and Alan might be resettled in the future to outside of the united sanitary protection zone of the Nizhnekamsk Industrial Zone (see Section 5.10 “Impact on Residents of Adjacent Areas”). Please see section 5.10 for more details.

It was not considered reasonable to make calculations relating to summation groups of pollutants, because concentrations of individual pollutants are insignificant and will not cause any non-compliance with the norms established for summation groups of pollutants.

**Calculation of indices of hazard (HI)**

It is more important from this viewpoint to determine the index of hazard\(^\text{30}\) for breathing organs, which is dependent on the integrated impact of several pollutants and determines the degree of risk for public health.

Indices of hazard for breathing organs exposed to simultaneous impact of nitrogen dioxide, sulfur dioxide, hydrogen sulfide, benzene, xylene and toluene is expected to be at a level not exceeding the acceptable norm (HI=1.0); the contribution of the Stage I facilities will be not more than 0.01, which is classified as low risk. The pertaining data is given in Table 5.1-9.

\(^{30}\) Index of hazard is a sum of hazard factors for pollutant of similar impact. Hazard factor is a ratio of a concentration of pollutant and its non-hazardous concentration (permissible concentration).
Table 5.1-9. Hazard indices (HI) for breathing organs in case of short-term ambient air pollution within the area impacted by the Stage 1 facilities

<table>
<thead>
<tr>
<th>Point Nos.</th>
<th>Total HI(^{31})</th>
<th>HI caused by emission sources of Stage I facilities</th>
<th>Contribution of Stage I facilities, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.548</td>
<td>0.021</td>
<td>3.9</td>
</tr>
<tr>
<td>2</td>
<td>0.702</td>
<td>0.048</td>
<td>6.9</td>
</tr>
<tr>
<td>3</td>
<td>0.532</td>
<td>0.035</td>
<td>6.6</td>
</tr>
<tr>
<td>4</td>
<td>0.610</td>
<td>0.059</td>
<td>9.6</td>
</tr>
<tr>
<td>5</td>
<td>0.486</td>
<td>0.024</td>
<td>5.0</td>
</tr>
<tr>
<td>6</td>
<td>0.690</td>
<td>0.026</td>
<td>3.8</td>
</tr>
<tr>
<td>7</td>
<td>0.534</td>
<td>0.002</td>
<td>0.4</td>
</tr>
<tr>
<td>8</td>
<td>0.534</td>
<td>0.006</td>
<td>1.1</td>
</tr>
<tr>
<td>9</td>
<td>0.536</td>
<td>0.011</td>
<td>2.1</td>
</tr>
<tr>
<td>10</td>
<td>0.455</td>
<td>0.039</td>
<td>8.7</td>
</tr>
<tr>
<td>11</td>
<td>0.606</td>
<td>0.009</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Predicted long-term atmospheric air pollution with air emissions from sources of the Stage 1 facilities

Long-term air pollution was assessed based on the same method and criteria, but with the use of MPC for average daily emissions applicable in the Russian Federation, the concentrations recommended by the World Health Organization and the integrated pollution index (contributions of over 0.001 MPCav.daily).

Calculations of the average annual levels of pollution were made according to the method described in Section 5.1.6.

Special attention was given to sulfur dioxide emissions due to the fact that in order to assess this type of pollution for atmospheric air quality the World Health Organization recommends to use daily criteria (based on concentration for 24 hours) in addition to instantaneous and average annual values.

The atmospheric air quality criteria used for the analysis of impact acceptability are given in Tables 5.1-1 and 5.1-2.

With respect to sulfur dioxide, additional analysis was carried taking into consideration the incinerator chimney as a separate emission source, because it will be the main sulfur dioxide emission source during the operation of the Stage 1 facilities.

According to an updated list of the emission source inventory, emissions from the incinerator chimney are expected at a rate of 17.96 g/s (with an SO2 concentration in the gas and dust mixture in the order of 189.8 g/m3).

---

\(^{31}\) Released from all emission sources within the Nizhnekamsk Industrial Zone.
The ground-level concentrations caused by emissions from the incinerator chimney will be very insignificant, i.e. less than 0.01 MPC (max. instantaneous value). In addition, the baseline sulfur dioxide concentration in the zone of the TANECO construction site is low (approximately 0.01 MPC). Hence the total values will be significantly below the permissible regulatory limits.

Table 5.1-10 contains the data relating to the average annual ground-level concentrations of pollutants, for which the long-term pollution level will exceed 0.001 MPC (average daily).

As it can be seen from the data, the calculated long-term pollution of atmospheric air with pollutants typical of the emissions from Stage 1 will comply with the applicable hygienic norms.

Table 5.1-11 contains data referring to baseline and predicted risk for public health after commissioning of the Stage 1 facilities with indication of a total hazard index. The contribution of new sources to air pollution varies from 10% to 80%.
Table 5.1-10. Long-term (average annual) ground-level concentrations of pollutants in ambient air in residential areas within the area impacted by Stage 1 facilities

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>Code</th>
<th>Calculated baseline concentration, portion of MPC (av.daily)</th>
<th>Calculated input into ground-level concentration caused by emission sources of Stage I facilities at the points selected for calculation (1-11), portion of MPC (average daily)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Iron trioxide</td>
<td>123</td>
<td>0.081</td>
<td>0.0002</td>
</tr>
<tr>
<td>Manganese</td>
<td>143</td>
<td>0.001</td>
<td>0.0001</td>
</tr>
<tr>
<td>Nitrogen dioxide</td>
<td>301</td>
<td>0.087</td>
<td>0.0176</td>
</tr>
<tr>
<td>Carbon black</td>
<td>328</td>
<td>0.017</td>
<td>0.0083</td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>330</td>
<td>0.039</td>
<td>0.0040</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>333</td>
<td>0.016</td>
<td>0.0050</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>337</td>
<td>0.002</td>
<td>0.0002</td>
</tr>
<tr>
<td>Benzene</td>
<td>602</td>
<td>0.006</td>
<td>0.0005</td>
</tr>
<tr>
<td>Xylene</td>
<td>616</td>
<td>0.004</td>
<td>0.0016</td>
</tr>
<tr>
<td>Toluene</td>
<td>621</td>
<td>0.002</td>
<td>0.0001</td>
</tr>
<tr>
<td>IPI for 10 pollutants</td>
<td>0.255</td>
<td>0.037</td>
<td>0.249</td>
</tr>
</tbody>
</table>
Table 5.1-11. Hazard indices for breathing organs in case of long-term exposure to pollutants

<table>
<thead>
<tr>
<th>Point Nos.</th>
<th>Total HI</th>
<th>HI, caused by Stage I facilities</th>
<th>Contribution of Stage I facilities %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.101</td>
<td>0.035</td>
<td>34.44</td>
</tr>
<tr>
<td>2</td>
<td>0.300</td>
<td>0.234</td>
<td>78.01</td>
</tr>
<tr>
<td>3</td>
<td>0.111</td>
<td>0.045</td>
<td>40.43</td>
</tr>
<tr>
<td>4</td>
<td>0.145</td>
<td>0.079</td>
<td>54.45</td>
</tr>
<tr>
<td>5</td>
<td>0.088</td>
<td>0.022</td>
<td>25.24</td>
</tr>
<tr>
<td>6</td>
<td>0.091</td>
<td>0.025</td>
<td>27.09</td>
</tr>
<tr>
<td>7</td>
<td>0.075</td>
<td>0.009</td>
<td>12.32</td>
</tr>
<tr>
<td>8</td>
<td>0.075</td>
<td>0.009</td>
<td>11.42</td>
</tr>
<tr>
<td>9</td>
<td>0.074</td>
<td>0.008</td>
<td>11.40</td>
</tr>
<tr>
<td>10</td>
<td>0.090</td>
<td>0.024</td>
<td>26.46</td>
</tr>
<tr>
<td>11</td>
<td>0.082</td>
<td>0.016</td>
<td>19.95</td>
</tr>
</tbody>
</table>

Hence, the level of air pollution with pollutants, which are significant during the TANECO Stage 1 operation, does not create any significant risk for human health. Risk of chronic diseases of breathing organs in case of long-term exposure is caused by 8 of 10 priority pollutants: iron trioxide, manganese and its compounds, nitrogen dioxide, carbon black, sulfur dioxide, hydrogen sulfide, xylene and toluene. The main contribution to the risk for breathing organs is made by nitrogen dioxide, i.e. over 50% almost in all affected residential areas.

The maximum risk level caused by priority pollutants on the long term during the operation of the Stage I facilities is expected in the village of Martysh and is estimated at 0.234 (which is below the acceptable level of hazard index of 1.0).

The contribution in terms of risk is assessed as low/insignificant, which means that the emission sources of the Stage I facilities will not cause any impairment of public health.

In conclusion, the data obtained suggest that despite a current high background concentration of pollutants, which will be released into the atmosphere from the sources at the Stage 1 facilities, the air pollution level after commissioning of the new facilities will not significantly change, except for the villages of Martysh and Ishteryakovo.

Neither short-term (20 minutes) nor longer (average hourly, average daily and annual) concentrations of pollutants will cause further non-compliance with the Russian and international hygienic norms or any unacceptable risk for human health even in the case of application of most stringent permissible limits in accordance with international recommendations.

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1 Relating to all sources existing in the Nizhnekamsk Industrial Zone.
Loading dock chamber at the Kama River

In the process of the dock chamber operation, licensed vessels (tugboat and push towboat) complying with the applicable environmental norms will be used. The manufacturer of the vessels will be responsible for their environmental compliance by guaranteeing the parameters indicated in the vessel specifications. Loading dock chamber doesn’t have any stationary air emission sources so calculation of ground-level concentrations is not applicable.

Potential air adverse impact from other air emission sources related to the loading dock chamber (vessels) is expected to be temporary and minor.

Conclusion

The results of model computations of pollutants dispersion and assessment of short-term and long-term air pollution with harmful substances within the area impacted by Stage 1 have demonstrated that:

• The expected levels of atmospheric air pollution with common pollutants, organic substances and other impurities, which will be released from the Stage 1 facilities, will not exceed the Russian regulatory maximum permissible levels of MPC (max. instantaneous) and MPC (average daily), as well as the concentration levels recommended by the applicable international standards;

• For the substances having high background concentrations (phenol, formaldehyde), the sources at the Stage 1 facilities will not cause any increase in their ground-level concentrations in the nearby residential areas;

• Taking into account the air emissions from the Stage 1 facilities, the overall level of risk for public health is classified as low.

5.1.5 Air Pollution Mitigation Measures during Construction and Operation of the Oil Refinery

Construction Phase

In order to reduce air emissions during the construction phase the following measures will be taken:

• Use of open fire to burn any materials or waste will be prohibited;
• Permanent monitoring of technological processes will be conducted to minimize emissions of pollutants;
• No materials and substances emitting toxic and carcinogenic substances will be used for construction;
• Equipment, machinery and transport vehicles used during the construction period will comply with the standards and specifications of manufacturers in relation to exhaust gas emissions approved by the sanitary supervisory agency;
• Minimization of exhaust gas emissions from diesel engines and adjustment of fuel systems will be carried out in due time;
• In the course of technical maintenance of machinery, special attention
will be given to the verification and the adjustment of fuel feedstock, ignition and gas distribution systems of engines. This will ensure complete fuel combustion, reduce fuel requirement and decrease significantly exhaust gas emissions;

- Fuel spills will be eliminated in the process of filling the construction machinery. Filling will be carried out in special areas with hard paving and containment bunding.

Operation Phase

To mitigate the negative impact of the Oil Refinery on the surrounding environment during its operation, an environmental action plan has been developed including measures aimed at reducing emissions by 7 t/year.

Such measures are listed below in Table 5.1-12.

*Table 5.1-12. Measures aimed at reducing emissions of pollutants to the atmosphere from TANECO complex during Stage 1 facilities operation*

<table>
<thead>
<tr>
<th>Description of measures</th>
<th>Expected effect of planned measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring of exhaust emissions from transport vehicles to determine their toxicity in accordance with an established schedule</td>
<td>Reduction of emissions exceeding the norms by 0.002 t/year</td>
</tr>
<tr>
<td>Construction of hydrocarbon gas utilization unit at railroad loading/unloading installation for Stage 1</td>
<td>Reduction of hydrocarbons emissions to atmosphere by 2 t/year</td>
</tr>
<tr>
<td>Introduction of sulfur manufacturing installation to utilize hydrogen sulfide</td>
<td>Reduction of emissions to atmosphere by 3.5 t/year</td>
</tr>
<tr>
<td>Construction of tanks with pontoon roofs in tank farms of Stage 1</td>
<td>Reduction of emissions to atmosphere by 1.5 t/year</td>
</tr>
</tbody>
</table>

In addition, the following measures are planned to resolve certain issues associated with emission reduction from water supply and wastewater removal facilities:

- Highly efficient water cooling towers will be used in water recycling systems;
- Oil recovery devices with covered surface will be used;
- Manholes in the industrial sewer networks will be of enclosed type; manholes on the roads will have double lids and the space between the lids will be filled with sand;
- Wastewater treatment facilities will be of enclosed type to a maximum possible degree.

*Mitigation measures within the Nizhnekamsk Industrial Zone*

The RT Cabinet of Ministers enacted in 2006 a decree, according to which the emissions from the facilities in the Nizhnekamsk Industrial Zone should be reduced by 20,000 t by 2010 (see table 2.3-1). This decree is aimed at
improvement of the ambient air quality within the area impacted by the Nizhnekamsk facilities on a long-term basis at the same time taking into account its further development.

A unified document specifying the maximum permissible air emissions (MPE document) and united sanitary protection zone design for the entire Nizhnekamsk Industrial Zone have been developed, including an assessment of the existing and future emissions of harmful pollutants from the entire industrial zone and taking into account the planned commissioning of the new TANECO Complex facilities (Stage 1, 2 and 3). According to the USPZ design, a number of environmental protection measures should be taken in 2007-2011 to minimize the negative impact of air emissions and ensure a total reduction in air emissions by 1787.81 t/year, which would mitigate air pollution within the area impacted by the TANECO Complex.

Currently, certain preventive and technological measures are being taken to reduce air emissions from the facilities within the Nizhnekamsk Industrial Zone. Preventive measures include keeping the equipment intact by means of scheduled preventive maintenance and repairs. The second group of measures is aimed at reducing pollutants emission into the atmosphere (replacement of obsolete column-type equipment, heat exchangers and pumps, reduction in fuel requirement, improvement of the gas treatment efficiency, etc.) and ambient air quality monitoring at the SPZ boundary.

Coordination of actions to reduce air pollution will be ensured jointly by the Working Group for environmental safety of the Nizhnekamsk Industrial Zone development, which includes representatives of the RT Ministry of Ecology and Natural Resources. These measures are specified in the design of the united sanitary protection zone and in the document specifying the maximum permissible air emissions (MPE document).

It is expected that, by the time of the Stage 1 commissioning, the measures for the reduction of pollutants emissions from the facilities in the Nizhnekamsk Industrial Zone into the atmospheric air will have been implemented and the contribution of the new facilities to the overall air pollution will be mitigated through the envisaged reduction. They will also ensure a reduction in the baseline air pollution from nitrogen dioxide, hydrogen sulfide, phenol, formaldehyde and other pollutants, which have currently rather high baseline concentrations.

After the commissioning of the Stage 1 facilities, in accordance with the Russian legislation the Company will conduct air pollution monitoring in the SPZ and the nearest residential areas. If required, additional measures will be developed and implemented with the objective of reducing emissions of pollutants into the atmosphere.

5.1.6 **Greenhouse Gas Emissions from Stage 1 after Commissioning**

Greenhouse gas ("GHG") emissions will be caused in the process of operation of Stage 1 from the following operations:

1. Direct combustion of hydrocarbons in power and technological units;
2. Combustion of hydrocarbons in installations of external organizations supplying electricity and steam for the TANECO Complex facilities;
3. Generation of wastewater containing organic components (petroleum hydrocarbons, etc.);
4. Storage of sludge residue generated at wastewater treatment facilities.

The approximate calculated amounts of GHG emissions were obtained on the basis of the design data and expected production capacities of Stage 1 and are given in Table 5.1-13.

**Table 5.1-13. Basic Data and Calculated Gross Emissions of Greenhouse Gases**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Basic data, $10^3$ t</th>
<th>Calculated emission of CO$_2$, Gg or $10^3$ t</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Emissions from combustion of hydrocarbon feedstock</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel requirement, $10^3$ t</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel gas</td>
<td>281.554</td>
<td>600.2065</td>
<td></td>
</tr>
<tr>
<td>Natural gas</td>
<td>29.422</td>
<td>55.4698</td>
<td></td>
</tr>
<tr>
<td>Flushing gas</td>
<td>924.360</td>
<td>1480.7352</td>
<td></td>
</tr>
<tr>
<td><strong>Direct greenhouse gas emissions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric power requirement, kWh/year</td>
<td>923145</td>
<td>550.19442</td>
<td>It is planned that electricity and steam of the new facilities will be supplied by OAO “GK Nizhnekamsk TEC” company specialized in electrical and thermal power generation</td>
</tr>
<tr>
<td>Steam requirement, $10^3$ t</td>
<td>4316.64</td>
<td>171.51</td>
<td></td>
</tr>
<tr>
<td><strong>Greenhouse gas emissions from wastewater treatment facilities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wastewater volume, m$^3$/year</td>
<td>11 685 183.00</td>
<td>110.42</td>
<td>Methane will be generated at the wastewater treatment facilities depending on wastewater volumes to be treated.</td>
</tr>
<tr>
<td>Volume of generated sludge, m$^3$/year</td>
<td>2628</td>
<td>0.8655</td>
<td>According to process flow chart, excess activated sludge will be sent for processing and utilization in the process of sludge processing, dewatered residue will be generated, which will be incinerated.</td>
</tr>
<tr>
<td>Total amount of emissions, $10^3$ t of CO$_2$ equivalent per year</td>
<td></td>
<td>2 969.4</td>
<td></td>
</tr>
</tbody>
</table>
In general, the GHG emissions from the Stage 1 facilities will reach 2,969,400 t CO₂ equivalent per year what is a preliminary assessment.

According to the EC Reference Document on Best Available Techniques for Mineral Oil and Gas Refineries (February 2003 edition, currently it is under review) for every million tones of crude oil processed by European refineries it is emitted 20 000 – 820 000 tones of carbon dioxide. The TANECO Oil Refinery will emit about 430 000 tones per million tones of crude oil processed, which is in line with the current practice for similar refineries.

After commissioning of the Oil Refinery, TANECO will measure and of GHG emissions quantities. Based on these data appropriate mitigation measures will be developed and implemented.

5.1.7 Proposal for Air Emission and Atmospheric Air Quality Monitoring

Construction phase of Stage 1

During the construction phase, air emission monitoring will be conducted mainly by the construction contractors and subcontractors, who should ensure annual checking of exhaust gas quality from engines of vehicles and machinery to verify their compliance with the environmental requirements in the RF and of the international finance institutions.

OAO “TANECO” will organize periodic monitoring of compliance of contractors and subcontractors working on the construction site with the applicable environmental requirements of Russian and international finance institutions.

To determine the background concentrations of impurities in atmospheric air and confirm the predicted concentrations during the construction phase it will be necessary to conduct background monitoring of atmospheric air within the zone affected by the TANECO facilities in the villages of Klyatle, Alan and Ishteryakovo in conformity with a program of routine environmental monitoring and the time schedule of environmental monitoring during the construction period of the TANECO facilities and Martysh in view of possible resettlement.

An appropriate item is included in the Environmental and Social Management Plan of the Oil Refinery (see Table 8.1 par. 1.2).

Operation phase

The following activities will be conducted by OAO “TANECO” during Stage 1 operation period with respect to atmospheric air quality monitoring will be:

- Automatic monitoring at 8 emission sources accounting in total for 80% of pollutants released to the atmosphere;
- Periodic monitoring (at least four times per day at the stationary station and up to 50 measurement of 8 pollutants per year with the aid of a mobile laboratory) at the boundary of the united sanitary protection zone of the Nizhnekamsk Industrial Zone near the villages of Klyatle, Alan, Martysh and Ishteryakovo with subsequent
assessment of the safety level of the impact of emissions from the new facilities on public health;

- Additional air monitoring within the Martysh settlement (see Table 8.1 par. 4.4).

For more details see Section 7.1 “Organization of Routine Environmental Monitoring”.

The monitoring data will permit a review of compliance with the design parameters and demonstrate compliance with the regulatory requirements to atmospheric air quality in the nearest residential areas affected by Stage 1.

An appropriate item is included in the Environmental and Social Management Plan (see Table 8.1 par. 1.3).

5.1.8 Conclusions

An assessment of impacts on the air quality from the TANECO Stage 1 facilities was based on the Russian methodological guidelines OND-86 with the use of empiric relationships for different periods of averaging of pollutants emissions.

Neither short-term (20 minutes) nor longer (average hourly, average daily and annual) concentrations of pollutants will cause any non-compliance with the Russian and international air pollution norms or any unacceptable risks for human health even in case of application of most stringent permissible limits in accordance with the pertaining international recommendations.

The impact of the emission sources of the new facilities will affect the nearest residential areas: Martysh (contribution to the total air pollution assessed in terms of the integrated hazard index will be 8.9%), Ishteryakovo (8.2%) and Alan (5.7%). There might be a need for the resettlement of the residents of Martysh and Alan in the future depending on the finalization of the USPZ at commissioning of the Oil Refinery and monitoring of the actual emissions (see section 5.10 for more details).

The background concentrations of phenol and formaldehyde exceed the sanitary and hygienic norms, however the contribution of the Stage 1 facilities will not cause any increase in the concentrations of these particular pollutants in the ambient air.

At the same time, pursuant to the RT Cabinet of Ministers’ Decree adopted in 2006 and aimed at improving the overall environmental situation within the area affected by the Nizhnekamsk Industrial Zone, the gross air emissions of the enterprises located in the Nizhnekamsk Industrial Zone are to be reduced by 20,000 t by 2010 (see Table 2.3-3 Section 2.3.2).

In accordance with the design of the united sanitary protection zone, the required measures to reduce the negative impact of pollutants emissions to the atmosphere for the period of 2007-2011 should ensure a reduction in the overall emissions by 1,787.81 t/year. Based on this design it may be expected that the overall baseline air pollution within the area impacted by the Oil Refinery will be reduced.

Implementation of the integrated measures to be taken by the enterprises of the Nizhnekamsk Industrial Zone will decrease the background
concentrations of main pollutants, with respect to which non-compliance with the relevant hygienic norms was reported.

Coordination of development and implementation of additional measures are performed jointly with the developer of the design of the sanitary protection zone of the Nizhnekamsk Industrial Zone – OAO KGPU “Orgneftekhimzavod” and representatives of the RT Ministry of Ecology and Natural Resources within the framework of the Working Group for environmental safety of the Nizhnekamsk Industrial Zone development.

5.2 WATER CONSUMPTION AND WASTEWATER MANAGEMENT DURING CONSTRUCTION AND OPERATION OF STAGE 1

5.2.1 Water consumption and wastewater removal during construction phase of Stage 1

During the construction phase of the Oil Refinery, water for sanitary and drinking needs on construction site will be supplied from the networks of the OAO “NizhnekamskNeftekhim” Company.

During the construction of the Stage 1 facilities, water will be required for the following purposes

- For sanitary and drinking needs of the construction personnel;
- For industrial needs, including:
  - Dust suppression in the area of earthmoving operations (only during the warm seasons);
  - Washing of wheels of vehicles leaving the construction sites (during warm seasons);
  - Hydraulic testing of pipelines / tanks before putting them into operations.

During the construction of the dock chamber on the Kama River, drinking water will be delivered by tank trucks. The construction design provides for the supply of drinking water for the needs of the construction personnel. The drinking water requirement for 1 employee has been estimated based on the relevant Russian norms [SNiP 2.04.02-84. Water Supply. External Networks and Facilities], i.e. 30 l for one employee per day.

Water for sanitation and general needs has been assumed based on the relevant Russian norms [SNiP 2.04.02-84. Sewerage Systems. External Networks and Facilities], i.e. 25 l per one employee per day.

Water requirement for industrial needs during the construction phase will vary depending on the type of work performed from 24.6 l/sec up to 384.7 l/sec. The firewater requirement has been calculated based on the assumed consumption rate of 105 l/sec.

Wastewater generated during the construction phase will be discharged to septic tanks and then removed to the nearest manholes of the existing sewerage network owned by OAO “NizhnekamskNeftekhim”.
Biotoilets will be installed at the construction site of the dock chamber. Sewage will be removed according to the prescribed procedure for treatment. Storm water runoff and snow-melt water will be drained from the graded sites. The amount of storm water runoff to be drained during the construction phase will be approximately 35,000 m$^3$/day. This amount may vary not only depending on the weather conditions but also the areas of paved sites and roads.

Water diversion ditches will be provided along motor roads for storm water and snow-melt water runoff drainage from areas free from constructed facilities.

Other measures aimed at preventing contamination of surface and underground waters during the construction phase are described in the section 5.3.3.

Taking into account the organizational and technical measures planned for protection of surface and underground waters during the construction phase, the environmental risks associated with water supply and wastewater removal will be minimal during the construction of the Stage 1 facilities.

### 5.2.2 Water Supply, Wastewater Removal and Treatment during the Operation Phase

For the operation phase of the Stage 1 facilities, the proposed solutions relating to water supply are based on the materials developed during the Stadiya Proekt, as well as on the process flow diagram and the block diagrams of the wastewater treatment facilities of OAO “TANEKO”. It should be noted that water supply, wastewater removal and treatment systems were designed for the entire Complex taking into account characteristics of all three Stages (chemical water composition, quantitative characteristics of water supply and wastewater removal systems, etc). So figures of the water balance, as well as wastewater treatment facilities are shown for all three Stages of the Complex.

For the Stage 1 the following wastewater treatment facilities will be constructed (please see Table 5.2-1 and Figure 5.2-2 for more details):

- all facilities for the treatment of wastewater from all Systems included in the pre-treatment, mechanical and biological treatment blocks (30% of the total amount);
- 100% of facilities for collection and treatment of recovered petroleum hydrocarbons (oil products dehydration block);
- 30% of facilities for residue and excess sludge collection and dewatering (sludge and slime dehydration block);
- 50% of facilities of the desalination block;
- Biodestruction area (site of sludge biological degradation);
- 30% of the volume of emergency-regulation tanks.

### Water Consumption

The following water supply systems are planned at the Complex site (please see Table 5.2-1 for more details about the Systems):

- Water supply for general and drinking needs;
• Firewater supply;
• River water supply;
• Reused water of System I, direct;
• Reused water of System I, recycled;
• Reused water of System II, direct;
• Reused water of System II, recycled;
• Reused water of System IIa, direct;
• Reused water of System IIa, recycled;
• Treated industrial effluents;
• Treated effluents from System II.

Water supply for general and drinking needs

Water for general and drinking needs will be supplied from the respective water supply networks of the OAO “NizhnekamskNeftekhim” Company with inlet at the northern border of the Complex site via two water pipelines. This water supply system is designed to provide water for the needs of the operating personnel and the canteen, as well as for the needs of the laboratory, laundry and air conditioning systems.

The quality of potable water shall comply with the relevant Russian norm [SanPiN 2.1.4.1074-01].

Water from OAO “NizhnekamskNeftekhim” will be supplied to the following facilities:

• Stage 1;
• Facilities at the off-site railroad tracks (Stations ‘Predkombinatskaya’ and ‘Tungucha’), PSP, GPS ‘Nizhnekamsk II’.

The potable water requirement for general and drinking needs will be 385 m$^3$/hour or 924.6 m$^3$/day.

Including:

• 316 m$^3$/hour; 660.2 m$^3$/day for general needs.
• 69 m$^3$/hour; 264.4 m$^3$/day for industrial needs.

The water requirement for drinking needs has been calculated taking into account the number of employees (4107 employees) with 1845 employees during a shift with a maximum number of personnel and based on the unit water requirement of 25 l/shift per one employee.

Firewater Supply

Two independent firewater supply systems are planned for indoor and outdoor fire suppression at the Oil Refinery and Petrochemical Complex of OAO “TANECO”:

- Firewater supply system for the facilities of the Oil Refinery (Stage 1);
- Firewater supply system for the facilities of the deep conversion plant (to be developed during Stage 2) that is not considered in the Report.

The firewater supply system for the Oil Refinery includes a pump station, storage tanks for a firewater reserve, firewater ponds of 250 m$^3$ capacity each, and a firewater pipeline of ring-shaped design. The overall firewater reserve
Oil Refinery

OAO “TANECO”

has been computed to ensure water for suppression of two fires at the same time (one in the production zone and another one in a tank farm for inflammable gases and liquids).

The maximum water requirement for simultaneous suppression of two fires shall be 1575 l/sec or 5671 m³/hour. These numbers were obtained based on the Russian firefighting norms.

The minimum required firewater reserve will have a capacity of approximately 13,000 m³, based on the requirement for simultaneous suppression of two fires.

For the firewater reserve storage, there will be two storage tanks of 10,000 m³ capacity each. The storage tanks will be equipped with devices for automatic replenishment of the water reserve if the water in the tanks lowers below a certain level. The time needed to restore the required firewater reserve after fire suppression will not exceed 24 hours.

The firewater tanks will be filled from the river water network; the pond for treated industrial effluents might serve as a stand-by source of firewater.

**River Water (Industrial Water Supply)**

Raw water for industrial needs of the TANECO Stage 1 facilities will be supplied from the Kama River water abstraction station operated by the Department for preparation of water for maintenance of pressure in geological formations of the OAO “Tatneft” Oil Company.

A river water supply system will be installed for the industrial needs of the Refinery. The main consumers of this water will be:

- The system for make-up water supply for the water recycling networks;
- Chemical water pretreatment facilities;
- Electric dehydrators of the CDU/VDU installation.

River water will be also used to fill the firewater storage tanks and firewater ponds.

To reduce the river water consumption for industrial needs, the Complex design provides for:

- Recycled water supply;
- Re-use of treated industrial effluents (after the treatment facilities will be put into operation as shown in Figure 5.2-2).

The river water requirement will be 3,242.33 m³/hour or 76,800.0 m³/day.

**Reused Water Supply**

The reused water supply system for Stage 1 will comprise of the following elements:

- Networks of Systems I, II and IIa
- Wastewater treatment facilities,
- Recycled water supply units.

Three water recycling systems are planned (I, II and IIa).
Water Reuse System I is designed for devices which are designed for the cooling or condensing of products, which are in liquid state under normal conditions or in an emergency situation under atmospheric pressure.

The overall recycled water requirement in System I will be:

direct 28,900.0 m$^3$/hour, recycled 28,900.0 m$^3$/hour.

Water Reuse System II is designed for devices which are designed for the cooling or condensing of products, which are in gaseous state under normal conditions or in an emergency situation under atmospheric pressure.

The overall recycled water requirement in System II will be:

direct 33,500.0 m$^3$/hour, recycled 33,500.0 m$^3$/hour.

Water Reuse System IIa is designed for condensers of steam turbines.

The overall recycled water requirement in System IIa will be:

direct 63,700.0 m$^3$/hour, recycled 63,700.0 m$^3$/hour.

The recycled water supply system is planned in the form of a ring network to be installed above ground (over a pipe rack together with process pipelines). At any outlet from the ring network there will be manual shut-off valves and water meters.

Since the facilities will be constructed in three stages, one water unit (No.1) will be constructed for the Stage 1 facilities to supply cooling water for Systems I, II and IIa of the process installations.

The capacity of the No.1 water unit and the overall maximum cooling water requirement of the Stage I facilities will be:

- for System I 10,400 m$^3$/hour
- for System II 8,600 m$^3$/hour
- for System IIa 3,400 m$^3$/hour

To make up for water loss in the water recycling systems (due to evaporation, entrainment, flushing, possible leaks), water will be added from the river water network to the water collection pond of the cooling towers depending on the water level in the pond.

It is also planned to use treated industrial effluents in order to reduce the river water consumption as make-up water.

Meters will be installed to monitor the amounts of water fed to the make-up water unit for each system.

Protection against corrosion will be ensured by the use of Dianodic DN 22420 reagents and microbiological monitoring including permanent and periodic treatment of recycled water (sodium hypochlorite together with biodispersing agent Depositol SF5101E; non-oxidizing biocide Spectrus MX 1103).

The total annual reagent requirement for the No.1 water unit (for the Stage I facilities) will be maximum 126.28 t.

The operation of the dock-chamber will not require any water.

Wastewater Removal

Wastewater will be removed from the Stage 1 facilities via the following systems (Figure 5.2-2):

- Industrial and storm water runoff drainage system (System I);
• Storm water drainage system (System III);
• Salt-containing effluents (System II), including a system for removal of acid-base effluents to the treatment conditions via a separate network operating under pressure; the treatment will include neutralization of acid-base effluents and subsequent combining of the stream with the system for salt-containing effluents for further treatment of the combined stream at local treatment facilities;
• sanitary wastewater (System IV).

**Industrial and storm water runoff drainage system** (System I):
This system is designed for reception and removal of neutral petroleum-containing industrial effluents, storm water and snow-melt runoff from the built-up area.

Wastewater will be generated in the process of:
• cooling of pumps, end seals and end seal boxes;
• cleaning of floors, containment areas and emergency sprinkling areas;
• chemical water pretreatment and condensate purification;
• water recycling system operation.

Storm water runoff will be drained via storm water inlets and pits to the storm water drainage network.

Water in the industrial and storm water runoff drainage system will flow by gravity and by means of pumps depending on the site profile.

There will be two pump stations to pump surface runoff from the western and southern parts of the site to the wastewater treatment facilities. Two pipelines (one from each pump station) will be laid on a pipe rack and be heated.

The gravity network will drain surface runoff from the northern and eastern parts of the site to the treatment facilities.

**Storm water drainage system** (System III):
Storm water runoff from the area free of any buildings and facilities, which is not polluted with any toxic substances, will be drained and undergo treatment.

It will be collected via trenches and pumped from the western and southern part of the site to the treatment facilities. Having passed the mechanical treatment section, it will be sent to the biological treatment section and blended with the treated industrial and storm water runoff.

**Industrial effluents (salt-containing and acid-base effluents)** (System II):
The system for salt-containing wastewater has been designed for the removal of wastewater contaminated with petroleum hydrocarbons, reagents, salts and other organic and inorganic substances (effluents from electric dehydrators).

The industrial effluent removal system will operate both with streams flowing by gravity and transferred by means of pumps.

The gravity system for removal of wastewater with high salt contents will receive the following streams:
• produced water from crude oil storage tanks;
• wastewater from cleaning of crude oil tanks;
• wastewater from the water demineralization plant;
• wastewater from the reverse osmosis unit;
• wastewater from the neutralization unit.

Salt-containing effluents *pumped* in a separate stream from process installations include wastewater streams from:

• the CDU/VDU installation with a high salt content and contaminated with petroleum hydrocarbons;
• the amine regeneration section;
• sulfur manufacturing section;
• flushing of recycling systems with high salt contents;
• vis-cracking installation.

Acid-base effluents will be generated at the following installations/processes:

• flaring of low-pressure hydrocarbon gases;
• flaring of acidic gases;
• catalyst regeneration unit;
• hydrogen production plant;
• hydrocracking sections;
• hydrogenization installation of catalytic cracking;
• sulfuric acid alkylation installation;
• production of pure terephthalic acid;
• continuous flushing of gas generators;
• diesel fuel hydrotreating section;
• reactor unit;
• washing of the suction lines of compressors (prior to start-up);
• etching of compressor suction lines.

Salt-containing effluents *under pressure* will be removed via a pipeline installed on a pipe rack to the planned wastewater treatment facilities of Stage 1.

Salt-containing effluents flowing by gravity will be removed via underground pipelines to the treatment facilities. Shut-off valves in normally closed position will be installed at all outlets from areas with containment barriers.

Acid-base effluents from the process installation will be pumped to the treatment facilities, where they will be neutralized and discharged to the system for salt-containing effluents and undergo further treatment as a united stream.

**Sewerage System** (System IV):

The planned sewerage system is designed to receive sanitary wastewater from the amenity facilities.

There will be both sewage streams flowing by gravity and pumped depending on the site profile.

All types of wastewater generated at the planned facilities with characteristics indicated in Table 5.2-1 will be sent to the treatment facilities for System IV.

Scheme of the water supply and wastewater removal balance of TANECO is given in figure 5.2-1.
Wastewater removal from the dock chamber site at the Kama River
During the operation phase, the dock chamber will not require any water, and only surface runoff from its industrial site will have to be removed. The surface runoff will be drained via storm water gutters to collectors located along the site perimeter.
In this way the potentially contaminated surface runoff will be contained to prevent migration of pollutants to surface water bodies and to soil.
Table 5.2-1. Characteristics of wastewater systems (streams) from the TANECO Complex

<table>
<thead>
<tr>
<th>Description of wastewater streams / wastewater removal systems</th>
<th>Wastewater source</th>
<th>Flow rate (maximum / average), m³/hour</th>
<th>Type of network</th>
<th>Wastewater characteristics</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial and storm water runoff (System I)</td>
<td>Neutral hydrocarbon-containing industrial effluents, storm water and snow-melt water runoff from the area built up with the facilities</td>
<td>2450 / 850</td>
<td>By gravity and under pressure</td>
<td>Petroleum hydrocarbons: Up to 1000 mg/l, Suspended matter: Up to 300 mg/l, Total salt content: max. 1000 mg/l, Surfactants: Up to 10 mg/l, Phenols: max. 50 mg/l, Ammonium nitrogen: 30 mg/l, Total hardness: 8 mg-equiv/l, Total alkalinity: 4 mg-equiv/l, COD: 500 mg/l, BOD&lt;sub&gt;total&lt;/sub&gt;: 300 mg/l, pH: 7-8.5</td>
<td>Treated wastewater is discharged to a collector pond (later recycled to the production process) or to additional treatment for release to the Kama River</td>
</tr>
<tr>
<td>Storm water runoff (System III)</td>
<td>Storm water runoff from the area free of buildings (assumed to be clean)</td>
<td>700 / 36</td>
<td>By gravity and under pressure</td>
<td>Petroleum hydrocarbons: 50 mg/l, Suspended matter: 600 mg/l, Chlorides: 20 mg/l, Sulfates: 200 mg/l, BOD&lt;sub&gt;total&lt;/sub&gt;: 160 mg/l, Total salt content: 500 mg/l, pH: 7.7</td>
<td></td>
</tr>
<tr>
<td>Industrial (salt-containing) effluents</td>
<td>Industrial facilities</td>
<td>600 / 530</td>
<td>By gravity and under</td>
<td>Petroleum hydrocarbons: Up to 1500 mg/l, Suspended matter: Up to 400 mg/l</td>
<td>Treated wastewater is subjected to</td>
</tr>
</tbody>
</table>
### Wastewater characteristics

<table>
<thead>
<tr>
<th>Description of pollutant / parameter</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total salt content</td>
<td>max. 2200 mg/l</td>
</tr>
<tr>
<td>Surfactants</td>
<td>Up to 8 mg/l</td>
</tr>
<tr>
<td>Phenols</td>
<td>max. 50 mg/l</td>
</tr>
<tr>
<td>Sulfates</td>
<td>250 mg/l</td>
</tr>
<tr>
<td>Sulfides</td>
<td>30 mg/l</td>
</tr>
<tr>
<td>Chlorides</td>
<td>9000 mg/l</td>
</tr>
<tr>
<td>COD</td>
<td>750 mg/l</td>
</tr>
<tr>
<td>BOD&lt;sub&gt;total&lt;/sub&gt;</td>
<td>450 mg/l</td>
</tr>
<tr>
<td>pH</td>
<td>7.8</td>
</tr>
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</table>

### Wastewater source

<table>
<thead>
<tr>
<th>Wastewater source</th>
<th>Flow rate (maximum / average), m³/hour</th>
<th>Type of network</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanitary wastewater (System IV)</td>
<td>60/ -</td>
<td>By gravity and under pressure</td>
<td>desalting for further injection for pressure maintenance in geological formations and partially recycled to the production facilities.</td>
</tr>
<tr>
<td>Amenities and general services</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description of wastewater streams / wastewater removal systems (System II)</th>
<th>Flow rate (maximum / average), m³/hour</th>
<th>Type of network</th>
<th>Wastewater characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total salt content</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>max. 2200 mg/l</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Surfactants</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Up to 8 mg/l</td>
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<td></td>
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<td></td>
<td>Phenols</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>max. 50 mg/l</td>
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<td></td>
<td></td>
<td>Sulfates</td>
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<td></td>
<td></td>
<td></td>
<td>250 mg/l</td>
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<td></td>
<td>Sulfides</td>
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<td></td>
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<td>30 mg/l</td>
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<td>Chlorides</td>
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<td>750 mg/l</td>
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<td>BOD&lt;sub&gt;total&lt;/sub&gt;</td>
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<td>450 mg/l</td>
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<td></td>
<td></td>
<td></td>
<td>pH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7.8</td>
</tr>
</tbody>
</table>

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Oil Refinery

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OAO “TANECO”
Figure 5.2-1. Water supply and wastewater removal balance of the entire TANECO Complex

- **Social and community facilities**
  - Potable water 924.6 m³/day
  - Water with oil 983 m³/day
  - Process condensate 3237 m³/day
  - River water 76,800 m³/day
  - Evaporation and entrainment 49944 m³/day

- **Industrial facilities**
  - Flushing 8664 m³/day
  - Sewage system I 18630 m³/day
  - Sewage system II 4060 m³/day
  - Storm water runoff from industrial site Q\text{daily}_{\text{max}} = 39100 m³/day (Q\text{daily}_{\text{avr}} = 1724 m³/day)

- **Wastewater treatment facilities**
  - Discharge to boreholes 1080 m³/day
  - To Kama River 9168 m³/day

- **Sewerage system**
  - Sewage 660,2 m³/day

- **Wastewater treatment facilities**
  - Flushing 8664 m³/day

- **Water supply blocks**
  - Sewage 660,2 m³/day
  - River water 76,800 m³/day
  - Evaporation and entrainment 49944 m³/day
  - Make-up water for water recycling systems 25488 m³/day
  - Storm water runoff from areas free of buildings Q\text{daily}_{\text{max}} = 15800 m³/day (Q\text{daily}_{\text{avr}} = 881.5 m³/day)
Wastewater Treatment. Description of the Wastewater Treatment Facilities for the TANECO Complex

Basic solutions for wastewater treatment:

- System I: two treatment lines including a unit for preliminary treatment, physicochemical and biological treatment;
- System II: a single line including a unit for preliminary treatment, physicochemical and biological treatment;
- System III: after preliminary treatment wastewater undergoes biological treatment together with wastewater from System I;
- System IV: after preliminary treatment wastewater undergoes biological treatment together with wastewater from System II.

The main facilities and apparatus, with an exception of the preliminary treatment unit, are designed for average flow rates and quality parameters. The preliminary treatment unit is designed for a maximum daily throughput. The preliminary treatment unit comprises emergency and regulation tanks with a total capacity of 140,000 m³ to compensate for maximum flow rates and emergency discharge of wastewater.

The basic flow chart of the wastewater treatment facilities of the TANECO Complex is shown in Figure 5.2-2.
Figure 5.2-2. Basic Flow Chart of the Wastewater treatment Facilities of the TANECO Complex
The wastewater treatment facilities are designed to ensure integrated treatment of industrial and storm water runoff, industrial effluents (wastewater with high level of salt content) and sanitary wastewater, including also treated effluent to be used as make-up water for water recycling systems.

The wastewater treatment facilities comprise the following blocks (units):
- Preliminary treatment block;
- Separation block;
- Flotation block;
- Biological treatment block;
- Desalination block;
- Collection and treatment block for petroleum recovered hydrocarbons;
- Residue and excess sludge collection and dewatering block;
- Block for after-treatment of wastewater to be released to the Kama River;
- Residue treatment block (a biodestruction site and a residue and waste incinerator);
- Monitoring and control unit.

The wastewater treatment facilities do not have any open wastewater surfaces, with an exception of the biological treatment unit.

Taking into account the fact that the Complex will be constructed in stages, the construction of the treatment facilities is also divided into two phases:

- Phase I will allow treatment of wastewater from technological facilities of Stages 1a1, 1a and 1b and will be built during the construction of the Oil Refinery;
- Phase II will permit treatment of wastewater from technological facilities of Stages 2 and 3 and is not considered in this Report.

As mentioned above, Phase I of the treatment facilities construction includes:
- all facilities for the treatment of wastewater from all Systems included in the pre-treatment, mechanical and biological treatment blocks (30% of the total amount);
- 100% of facilities for collection and treatment of recovered petroleum hydrocarbons (oil products dehydration block);
- 30% of facilities for residue and excess sludge collection and dewatering (sludge and slime dehydration block);
- 50% of facilities of the desalination block;
- Biodestruction area (site of sludge biological degradation);
- 30% of the volume of emergency-regulation tanks.

Individual units and sections (blocks) of the wastewater treatment facilities are described in more detail below.
Preliminary treatment unit

The preliminary treatment (or pre-treatment) unit of each system is designed for protection of the main treatment facilities against garbage, accidental and emergency discharge of pollutants and for regulation of wastewater stream. The system consists of:

- Mechanized grid in combination with a sand trap;
- Percolator for sanitary wastewater;
- Settling section in the form of a semi-covered semi-buried reinforced concrete tank equipped with a system for recovery and removal of petroleum hydrocarbons and residue;
- Sand drying area.

The throughput capacity of the grids, sand trap and settling tank has been designed for the maximum daily wastewater stream. The preliminary treatment unit includes also two emergency tanks with a capacity of 100,000 m³ and 40,000 m³.

The entire volume of wastewater to be treated at the treatment facilities from the Oil Refinery and off-site infrastructure located within the Nizhnekamsk Industrial Zone (GPS “Nizhnekamsk-II”, PSP (crude oil delivery and acceptance point), railroad stations ‘Tungucha’ and ‘Predkombinatskaya’) will pass through the preliminary treatment unit.

Clarified wastewater leaving the preliminary treatment unit (storm water, industrial and sanitary wastewater) will be distributed into the following Systems that will be built during Stage 1:

- System I to physical chemical treatment in System I;
- System II to physical chemical treatment in System II;
- System III to biological treatment together with effluents from System I;
- System IV to biological treatment together with effluents from System II.

If the average flow rates are exceeded, the excess of clarified wastewater will be sent:

- effluents of sewerage systems I and II go to the emergency and regulation tanks, with a total capacity of 100,000 m³;
- assumable clean wastewater (System III) goes to the emergency and regulation tanks with a total capacity of 40,000 m³.

Sand collected in sand traps will be pumped to sand site and after drying removed and used to backfill of excavations. The expected amount of sand will be 88 m³/year (on the dry basis).

Mechanical treatment block consists of separation units and flotation units. Below these units are discussed separately.

Separation unit

The separation unit is designed to remove petroleum hydrocarbons and mechanical impurities by gravity from the clarified wastewater stream from Systems I and II (industrial and storm water runoff and industrial effluents).
Recovered petroleum hydrocarbons will be sent to an area for their collection and treatment.

The residue will be collected, dewatered and utilized. Wastewater treated in the separators will be sent to a flotation section.

**Flotation unit (included in the mechanical treatment block)**

The flotation unit is designed to treat wastewater from Systems I and II after the separation unit by means of flotation with the use of reagents.

The flotation section consists of flotation machines equipped with systems for air feeding and dispersion and froth collection and removal.

Froth with carrier water will be sent to a unit for residue collection, dewatering and utilization.

Treated wastewater will be sent to the biological treatment section.

**Biological treatment unit**

The biological treatment section is designed for integrated purification of wastewater using the technology of the Zenon-GE Wend PT Company.

The unit will receive industrial and storm water runoff and industrial effluents treated in the flotation section and storm water runoff and sanitary wastewater after mechanical treatment.

The biological treatment section consists of:

- semi-buried reinforced concrete tank divided into an anaerobic zone and an aerobic zone;
- semi-buried reinforced concrete tank with submerged ultra-filtration membranes of Zee Weed type;
- air blowing station;
- pump stations (submerged pumps) integrated in the main section;
- agitation units integrated in the main section;
- pump equipment.

Reagents to the biological treatment section will be fed from a unit for reagent preparation and feeding.

Treated wastewater will be sent:

- Wastewater from System II and sanitary wastewater: to desalination block;
- Part of wastewater from Systems I and II: to the dewatering block (10% to 15%);
- Part of wastewater from Systems I and II: to the collector pond with a capacity of 1 million m³.

Excess sludge from the biological treatment section will be sent to the unit for residue and excess sludge collection and dewatering.

The collector pond with a capacity of 1 million m³ will permit storage of treated wastewater and maintain a permanent required firewater reserve. The pond design incorporates some features, which prevent silting of the pond.
Desalination block

The desalination block is designed to remove salts from treated wastewater to make it suitable for re-use as make-up water in waste recycling systems. Desalination is performed based on reverse-osmosis membranes. The membranes are installed in standard-type devices. Water after desalination is blended with water not subjected to desalination to maintain a salt content of max. 500 mg/l at a rate of 1,062 m$^3$/hour to be recycled to water recycling systems as make-up water.

Brine (effluents with high salinity level) will be sent at a rate of 45 m$^3$/hour (1,080 m$^3$/day) to the pressure maintenance system of the oil and gas production division of “PrikamNeft” for injection into geological formations.

The capacity of the injection system of “PrikamNeft” is 1,100 m$^3$/day.

According to the research conducted, effluents with high salinity level, which will be generated at the Oil Refinery, are compatible with the produced water from the Biklyanskoye oil field. In addition, it is also possible to use the effluents for injection in the Yelabuga and Sobokolevskoye fields with use of inhibitors.

In order to realize the entire cycle for use of wastewater with high salt concentrations from the TANECO facilities it will be required to:

- determine a location for the point of reception of the effluents for the pressure maintenance system of “PrikamNeft”;
- select a route for transportation of this type of effluents to the reception point;
- carry out detailed engineering design development for the pipeline including selection of material and appropriate design solutions; and
- obtain the required permits and approvals for construction of a pipeline for salt-containing effluents to the pressure maintenance system of “PrikamNeft”.

Corresponding items have been included in the Environmental and Social Management Plan (see Table 8.1 par. 2.1).

Block of Integrated Treatment (Final Treatment Block)

Treated wastewater from Systems I and III, which will not be re-used for water recycling systems, will be sent to a final treatment unit (block of integrated treatment) comprising sorption devices and ultraviolet treatment devices.

After having passed through the sorption and UV treatment devices, the treated wastewater will comply with all Russian requirements for treated wastewater and may be discharged to water bodies of fishery significance. The given treated wastewater stream will be released in this case to the Kama River. Prior to release to the river the wastewater will undergo appropriate analyses to confirm its compliance with the regulatory maximum permissible concentrations of pollutants.

The characteristics of treated wastewater to be discharged to the Kama River are given below in Table 5.2-2.
<table>
<thead>
<tr>
<th>Water quality indicators</th>
<th>Unit of measurement</th>
<th>IFC Guidelines</th>
<th>Characteristics of treated wastewater to be released to the Kama River</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspended matter</td>
<td>mg/l</td>
<td>30</td>
<td>0.25</td>
</tr>
<tr>
<td>Petroleum hydrocarbons</td>
<td>mg/l</td>
<td>10</td>
<td>0.05</td>
</tr>
<tr>
<td>BOD total</td>
<td>mgO2/l</td>
<td>30[33]</td>
<td>3</td>
</tr>
<tr>
<td>COD</td>
<td>mgO2/l</td>
<td>150</td>
<td>80</td>
</tr>
<tr>
<td>pH value</td>
<td>-</td>
<td>6-9</td>
<td>6.5 - 8.5</td>
</tr>
<tr>
<td>Chloride</td>
<td>mg/l</td>
<td></td>
<td>300</td>
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<tr>
<td>Sulfate</td>
<td>mg/l</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Sulfide</td>
<td>mg/l</td>
<td>1</td>
<td>0.01</td>
</tr>
<tr>
<td>Dry residue (salts)</td>
<td>mg/l</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>Ammonium nitrogen</td>
<td>mg/l</td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>Nitrate</td>
<td>mg/l</td>
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<td>40</td>
</tr>
<tr>
<td>Nitrite</td>
<td>mg/l</td>
<td></td>
<td>0.08</td>
</tr>
<tr>
<td>Surfactants</td>
<td>mg/l</td>
<td></td>
<td>0.5</td>
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<tr>
<td>Calcium</td>
<td>mg/l</td>
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<tr>
<td>Aluminium</td>
<td>mg/l</td>
<td></td>
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</tr>
<tr>
<td>Iron</td>
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</tr>
<tr>
<td>Copper</td>
<td>mg/l</td>
<td>0.5</td>
<td>0.0001</td>
</tr>
<tr>
<td>Zinc</td>
<td>mg/l</td>
<td></td>
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</tr>
<tr>
<td>Manganese</td>
<td>mg/l</td>
<td></td>
<td>0.01</td>
</tr>
<tr>
<td>Nickel</td>
<td>mg/l</td>
<td>0.5</td>
<td>0.01</td>
</tr>
<tr>
<td>Vanadium</td>
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<td>0.001</td>
</tr>
<tr>
<td>Chromium (6+)</td>
<td>mg/l</td>
<td>0.05</td>
<td>0.02</td>
</tr>
<tr>
<td>Chromium (3+)</td>
<td>mg/l</td>
<td></td>
<td>0.07</td>
</tr>
<tr>
<td>Phenol</td>
<td>mg/l</td>
<td>0.2</td>
<td>0.001</td>
</tr>
<tr>
<td>Benzene</td>
<td>mg/l</td>
<td>0.05</td>
<td>0.5</td>
</tr>
<tr>
<td>Toluene</td>
<td>mg/l</td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>Xylene</td>
<td>mg/l</td>
<td></td>
<td>0.05</td>
</tr>
<tr>
<td>Terephthalic acid</td>
<td>mg/l</td>
<td></td>
<td>0.05</td>
</tr>
<tr>
<td>Phosphate phosphorus</td>
<td>mg/l</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td>Dissolved oxygen</td>
<td>mg/l</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

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[32] This value refers to BOD₅.
The above comparative data indicates that the expected concentrations of all pollutants are much below the levels recommended by the IFC for oil refineries with an exception of benzene, the concentrations of which exceeds the recommended maximum value by a factor of 10. At the same time, the benzene content in treated wastewater complies with the Russian norms for water in fishery water bodies. According to the applicable classification this substance is rated as Hazard Class 4. In this connection, the benzene content in the Kama River will comply with the Russian norms and release of this treated wastewater stream with the expected benzene concentration of 0.5 mg/l would not aggravate the negative impact on this watercourse. In the future, analysis of water samples during the operation of the new facilities will be conducted prior to release of this wastewater stream to the Kama River. Based on it’s results it will be required to undertake the following:

- specify the concentrations of pollutants in the wastewater to be released to the Kama River;
- consider an option to reduce the benzene content (based on the analyses) in treated wastewater to take into account the IFC recommendations.

Corresponding items have been included in the Environmental and Social Management Plan (see Table 8.1 par. 2.2).

**Oil Products Dehydration Block (Block for collection and preparation of recovered petroleum hydrocarbons)**

The block for collection and preparation of recovered petroleum hydrocarbons has been designed to collect water-containing petroleum hydrocarbons recovered at the treatment facilities and to prepare them for recycling to the technological process as hydrocarbon feed.

This block receives recovered water-containing petroleum hydrocarbons from the preliminary treatment sections of Systems I, II and III, from the separation unit for Systems I and II and froth from the flotation unit for Systems I and II.

After appropriate preparation in this section, hydrocarbons are pumped to the technological process for further processing as hydrocarbon feed; the aqueous phase is recycled to the preliminary treatment unit for wastewater from System II and the solid phase is sent to the residue utilization unit.

**Sludge and Slime Dehydration Block (Block for collection and dewatering of residue and excess sludge)**

This unit is designed for collection, dewatering and utilization of residue and excess sludge.

The unit will receive:

- water-containing residue from the preliminary treatment block for Systems I, II and III from the separation block of Systems I and II and from the hydrocarbon collection and dehydration block;
- excess sludge from the biological treatment block of Systems I and II.

As a result of residue dewatering the following products will be produced: water
contaminated with suspended matter and petroleum hydrocarbons and dewatered residue.
Contaminated water obtained after residue dewatering will be sent to the hydrocarbon collection and dehydration block.
As a result of excess sludge dewatering, the following products will be produced: water contaminated with suspended matter and dewatered excess sludge (residue).
Contaminated water obtained after excess sludge dewatering will be sent to the preliminary treatment block of System II.
The obtained residue will be sent to processing in the residue and solid waste processing block.
Residue processing will be performed in an area for biodestruction and in a residue and waste incinerator.
The biodestruction area constitutes of a concrete-paved area with containment barriers and will be equipped with a mechanized ripper, reagent addition facilities and a spraying system.
The residue incinerator will permit not only incineration of dewatered residue and other waste types (garbage, wiping materials, liquid waste, etc.), but also generation of secondary heat energy.
The wastewater treatment facilities will comprise a monitoring and control unit for:
- centralized control of all wastewater treatment facilities and equipment, as well as the entire process;
- detecting any deviations from the preset parameters, regulate process conditions according to predetermined algorithms;
- generating process and emergency messages;
- monitoring and managing all auxiliary systems (ventilation, heating of rooms, monitoring and warning about harmful gas contents of ambient air; as well as
- equipment and personnel protection in case of emergency.

5.2.3 **Main measures for protection and sustainable use of water resources**

In order to protect and use water resources in a consistent and sound way during the construction and operation phases of the TANECO Stage 1 it is planned to take the following integrated measures:
- use of water recycling systems to reduce the river water requirement;
- water of potable quality will not be used for industrial needs;
- treatment of wastewater before release of the effluents, which have acceptable content of contaminants, to the Kama river;
- to minimize the amount of wastewater generated at the planned facilities.
Additional measures to reduce impacts and prevent contamination of surface and underground waters during the construction and operation phases are set forth in the corresponding Sections (5.3.3 and 5.5).

To ensure compliance with the predetermined technological parameters of the planned wastewater treatment facilities and facilitate their construction, it is required to:

- Complete selection of suppliers of specific technological equipment for all planned treatment units and sections;
- Perform detailed engineering design for the entire scope of the treatment facilities (i.e. Phase I and Phase II).

A corresponding item has been included in the Environmental and Social Management Plan for the TANECO Stage 1 facilities (see Table 8.1 par. 2.3).

5.3 IMPACTS ON WATER BODIES IN THE COURSE OF TANECO PROJECT IMPLEMENTATION (STAGE 1)

5.3.1 Impacts on Surface Water Bodies

Watercourses in the Project area belong to the basin of the Kama River, the main transit watercourse of the region. The main draining watercourse is the Zai River; secondary watercourses are the Kashaeva river with its tributaries – Alanka and Klaytlinka rivers; the Zycha River with its second-order tributaries – Avlashka, Martyshka and Inysh rivers. The Omshanka River, tributary to the Kama River, flows to the north of the Nizhnekamsk Industrial Zone.

The wastewater removal system in the process of operation of the Stage 1 industrial facilities will ensure treatment of all wastewater streams with subsequent discharge to an accumulating pond for further recycling in the production process or additional treatment to meet the requirements for water quality in fishery water bodies (with subsequent release to the Kama River). This means that provided compliance with these requirements, there will not be any direct impact on the Kama River, a major watercourse in this region.

Construction of Linear Facilities

In the process of Stage 1 implementation, impact of man-made origin on surface water bodies may take place as a result of construction of linear facilities: trunk pipeline for petroleum products (surface watercourses), off-site oil pipeline (Inysh and Martyshka rivers), railroad tracks (Tungucha River), power transmission line (Alanka River), off-site motor roads (road form the new mooring facilities of “TransKama” to the construction site, road to Ishteryakovo and to the sludge collection pond), as well as off-site water pipeline and gas pipeline (various watercourses).

Main negative impacts of construction work can be:

- Water turbidity in watercourses as a result of an increase in the concentration of suspended matter released to water in connection with
disturbance of the soil and vegetative cover integrity and erosion intensification; formation of drift accumulations as a result of pipeline laying in riverbeds, affecting thereby the organoleptic indicators of water quality;

- Changes in the hydraulic regime in connection with re-distribution of bottom sediments (sand, silt) and disturbance of migration ways of fish;
- Silting of downstream river stretches;
- Stunting and disturbance of hydrobionts;
- Loss of forage resources for fish (plankton and benthos);
- Deterioration of the overall ecological condition of rivers;
- Destruction of spawning grounds in floodplain stretches of rivers;
- Pollution of river floodplains and water with petroleum hydrocarbons; contamination of riverbeds with construction debris and waste.

Construction of off-site treated wastewater pipeline (sewer line) was approved by Srednevolzhsky municipal administration of RF Goskomrybolovstvo. Fishery losses from construction and operation of the pipeline and dispersive discharge to the Kama river were estimated at 565.55 thousand rubles.

In the process of construction of the offsite oil pipeline, in addition to the negative impact factors listed above, contamination of surface waters might be caused also by use of heavy machinery and due to high water requirement.

In the course of earthmoving operations it is possible that surface runoff would be contaminated with solids and petroleum hydrocarbons. River crossings at minor watercourses are especially vulnerable in this respect, because they will be constructed by trenching method.

A major portion of mechanical pollutants generated in the process of motor road construction consists of silica (sand), clayey particles, iron oxides and carbon black. Chemical pollution will be caused by water-soluble components of fuel and lubricant materials and washing fluids. Contrary to chemical pollution, mechanical contaminants are in most cases not toxic. They cause water turbidity and change the odor and taste of water.

The construction site is located outside of the protection zone of any surface water bodies. No wastewater discharge to surface water bodies is planned.

Main measures to protect surface water bodies during construction phases of linear facilities are as follows:

- Traffic of vehicles only over existing roads and within the right-of-way.
- Washing machinery in watercourses prohibited.

Please see in Subsection 5.3.3 for more details
Operation of Linear Facilities

In the process of operation of linear facilities and in case of non-compliance with the main environmental requirements, the following negative impacts may take place:

1. In case of ruptures of petroleum product pipeline:
   - Oil spill and contamination of the river floodplain with petroleum hydrocarbons;
   - Stunting of vegetation and wildlife;
   - Contamination of water with petroleum hydrocarbons.

2. In the process of operation of pump stations:
   - Surface runoff from industrial sites;
   - Leaks;
   - Untreated domestic wastewater and industrial effluents.

3. In the process of operation of offsite railroad tracks:
   - Wastewater from the locomotive and railroad car depots generated as a result of washing of the rolling stock, assemblies and components prior to repairs;
   - Wastewater from the area for railroad car preparation generated as a result of internal and external railroad car washing after transporting of different types of freights. This wastewater is usually contaminated with heavy minerals, contains dissolved salts, petroleum hydrocarbons from car bogies, organic compounds of animal and plant origin, which cause fouling of wastewater;
   - Wastewater from washing and steaming of railroad tank cars transporting petroleum, diesel fuel, fuel oil, kerosene, gasoline (including leaded gasoline), lubricating oils and other petroleum products, as well as wastewater from washing of loading racks and launders. This wastewater is contaminated mainly with petroleum hydrocarbons and suspended matter. Wastewater from external railroad car washing contains mainly suspended matter and petroleum hydrocarbons. Its temperature exceeds 60°C.

The nearest water bodies exposed to contamination will be the Tungucha and Inysh rivers and nameless creeks crossing the site and flowing in the vicinity of its borders.

The Company plans a number of measures to mitigate the impact on the surrounding environment both during the construction and operation of linear facilities.

Main measures to protect surface water bodies during operation phases of linear facilities will include construction of efficient drainage of motor and rail roads, additional reinforcement and prevention of migration of potential contamination to surface water bodies.
These measures, if implemented in proper manner in the process of construction and operation of linear facilities, will be adequate and sufficient to reduce the environment impacts to an acceptable level. The list of planned measures is given in Section 5.3.3.

Construction and Operation of Areal Stage 1 Facilities

Construction of Production Installations and Associated Facilities of Stage 1

The construction work for Stage 1 may cause the following main negative impacts:

- Increase the water turbidity in watercourses due to an increase in the concentration of suspended matter released to water as a result of disturbance of the soil and vegetative cover integrity and erosion intensification; formation of drift accumulations as a result of construction work, affecting thereby the organoleptic indicators of water quality;
- Changes in the hydraulic regime in connection with re-distribution of bottom sediments (sand, silt) and disturbance of migration ways of fish;
- Silting of downstream river stretches;
- Stunting and disturbance of hydrobionts;
- Loss of forage resources for fish (plankton and benthos);
- Deterioration of the overall ecological condition of rivers;
- Destruction of spawning grounds in floodplain stretches of rivers;
- Contamination with fuel and lubricants in the course of operation of construction machinery.

One of the main sources of surface water contamination are the storage tanks in the tank farms, intermediate tanks and production installations (in case of leaks from tank bottoms and walls, damage of tanks, etc.).

The following causes and factors can potentially entail spills of petroleum products:

- Failure of process equipment;
- Mistakes by the operating personnel;
- Impacts of natural and man-made origin, including discharge of static electricity, lightning discharges, tornado and hurricanes, spring floods, torrential rains, etc.;
- Combination of the following factors: defects, environmental conditions, non-compliance with the design requirements and storage tank operation.

A potential source of large-scale oil spills is the storage tanks in tank farms, intermediate tanks and production installations (in case of leaks from tank bottoms and walls, damage of tanks, etc.).

The proposed measures aimed at minimizing a risk of emergencies, if implemented in proper manner in the process of construction and operation of production installations and associated facilities, are adequate and sufficient to reduce the environment impacts to an acceptable level of risk.
Main measures to be taken to protect surface waters during the operation of the water supply and wastewater removal systems is proper hydraulic insulation, as well as wastewater collection and treatment prior to release to the Kama River (for more details see Section 5.3.3).

Construction and operation of landfill for industrial waste disposal

Construction work can cause water turbidity increase in watercourses as a result of a growth in the concentration of suspended matter released to water due to disturbance of the soil and vegetative cover integrity and erosion intensification caused by earthmoving operations.

In the process of the landfill construction it is necessary to plan appropriate environmental protection measures, including provision of bottom liner and a system for leachate collection and treatment. Such measures will ensure protection of ground and surface waters from contamination as a result of potential leaks (these measures are summarized in Section 5.3.3, as well).

During the landfill operation, environmental monitoring should be carried out, including surface runoff monitoring (see Section 5.5 “Waste management”).

A creek is flowing in the vicinity of the planned landfill boundary; it is tributary to the Klaylinka River belonging to the Kama River basin. In this connection, special attention should be paid to monitoring of the condition of this surface watercourse.

Construction of a dock chamber (point facility)

Construction of a dock chamber will impose impact on all environment media, and the following main objects will be exposed to impact:

- Surface water body (Kama River);
- Vegetation and wildlife in the coastal area;
- Fish resources and feeding reserves;
- Human health.

The impact of the construction process, although of temporary character, will have a higher intensity than the impact during the operation phase. The high degree of consequences will be attributed to the large scale and fast intrusion into the natural system, which will have no time to adapt to it.

The construction process will cause the following temporary impacts:

- Impacts on the natural environment by operating construction machinery and mechanisms;
- Changes in the hydrodynamic conditions of the water reservoir area;
- Water turbidity;
- Secondary contamination with substances accumulated in bottom sediments;
- Contamination of the coastal area with construction debris and waste and with domestic garbage;
- Disturbance of the natural conditions of fish habitats;
- Removal of the vegetative cover on the land allocated for construction; however, due to the temporary character of this impact and a relatively small area affected, the vegetation can recover within a short period of time.

In order to determine the degree of possible impact on the ichthyofauna and its feed resources, the potential damage to fish resources which would be caused by the dock chamber construction in Nizhnekamsk District was estimated in the Old Kama river branch.

As a result of this assessment, the damage was estimated:
  - From losses of feeding organisms at 1.59 t;
  - From losses of young fishes and taking out of nature area at 0.896 t.

The damage in terms of money (compensation amount) to the Kama river aquatic bioresources as a result of construction work of the dock chamber was estimated at 944,396 Rubles, based on RF standards for such type of damage.

Maximum calculated time duration of reparation of bioresources is 4 years. OAO “TANECO” made a contract with the Kaybitsky fish farm for reproduction of fish resources. Contractual payment is to be in November, 2008.

**Operation of a dock chamber (point facility)**

The following types of impact on the natural environment will be caused in connection with the dock chamber operation as a permanent engineering facility with specific structural features:
  - Withdrawal of a certain area;
  - Disturbance of the existing landscape and coastline;
  - Intensification of landslide processes;
  - Modification of surface runoff pattern and conditions;
  - Impact on hydrogeological regime;
  - Changes in the hydrogeological regime of the watercourse and intensification of riverbed processes;
  - Changes in the conditions of plant growth and habitats of fauna, including ichthyofauna.

Main mitigation measures will include the following:
  - Creation of gradual differences in levels and increase in the stream flow rate in comparison with the natural flow rates.
  - Compliance with the special requirements within the water protection zone (a set of environmental protection measures, e.g. restriction vehicles washing, chemical storage, etc.).
  - Planting of trees, shrubs or grass to create a coastal protective strip.

The planned measures are summarized in Section 5.3.3.
5.3.2 Impacts on Underground Waters during Stage 1 construction and operation phases

Impacts of the Stage 1 facilities on the underground water quality can be caused by migration of pollutants through the aeration zone into water-bearing horizons, because groundwater occurs at a depth of 1-1.8 m.

The area planned for the construction of Stage 1 is prone to saturation of the ground with underground waters. This is attributed to occurrence of irregular shallow temporary water (verkhovodka) and to the loose consistency of sandy silts and clays overlying the permanent water-bearing horizon.

In the process of construction and operation it is also possible that the upper portion of the cross-section would be saturated with shallow groundwater, because construction of roads, underground networks, excavation of pits and trenches facilitates intensification of water infiltration.

The following main causes of negative impacts on underground waters during the construction and operation phases will take place:

During construction phase:

- Changes in the groundwater regime and groundwater contamination due to earthmoving operations with the use of heavy machinery;

During operation phase:

- Possible transfer of waste to the adjacent areas, and as a consequence, migration of pollutants into underground waters;
- Seepage and leaks associated with:
  - Surface water drainage;
  - Sanitary wastewater removal;
  - Industrial effluent removal;
- Utilization of salt-containing industrial effluents from the Stage 1 facilities for injection into geological formation to maintain pressure in oil fields.

Issues relating to waste management, risks associated with waste generation, short-term onsite storage, transportation and disposal or recycling, as well as the required measure aimed at minimizing the impacts of generated waste on the environment to an acceptable level are discussed in Section 5.5 “Waste Management”.

Risks associated with surface runoff, sanitary and industrial wastewater removal, as well as measures for minimization of wastewater impacts on the environment are discussed in Section 5.2 “Water Supply and Wastewater Removal” and in Section 5.3.3.

Underground water monitoring will be carried out in order to timely identify underground water contamination and take adequate corrective measures. Issues relating to underground water monitoring are considered in Section 7 “Monitoring and Supervision”.
In conformity with the project design materials it is planned to utilize salt-containing industrial wastewater for injection into geological formation to maintain pressure in oil fields.

The studies conducted have indicated that water for injection is required in the Biklyanskooye oil field and it is also possible to inject water into absorbing horizons in the Yelabuga and Sobolevskoye oil fields, where Devonian and Carboniferous horizons are exploited; in the Biklyanskooye oil field it is Carboniferous horizons.

In the process of these studies it was demonstrated that the mentioned volume of water can be injected in the oil fields exploited by the oil and gas producing division of “PrikamNeft” provided that the wastewater from the Stage 1 facilities would be compatible with the produced water in the oil fields in question.

Compatibility of produced water and injected water was assessed on the basis of theoretical calculations and experimental studies. Theoretical calculations were made on the basis of chemical analyses of water to be used. At the same time the possible formation of calcium carbonate and sulfate and iron sulfide was assessed because these salts are most frequently found in the precipitates in oil fields. Furthermore, experimental studies were carried out by mixing water types under study in certain proportions.

Based on the results obtained, it has been concluded that the salt-containing industrial wastewater from the facilities is compatible with produced water in the oil fields and it can be injected into the water injection wells of the oil fields operated by “PrikamNeft”.

In general, provided that the measures planned for minimization of risks associated with waste generation, short-term onsite storage, transportation and disposal, as well as with surface runoff, sanitary and industrial wastewater removal are implemented the impact on underground waters during construction and operation of Stage 1 will be below the permissible level.

5.3.3 Measures for Prevention and Mitigation of Negative Impacts on Surface and Underground Waters

To prevent contamination and reduce the negative impacts on surface and underground waters, a wide range of measures is planned in the process of construction and operation of the Oil Refinery, linear facilities and loading dock chamber. These measures are described in Table 5.3-1.

<table>
<thead>
<tr>
<th>Measures to be taken</th>
<th>Expected results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Construction phase</td>
<td></td>
</tr>
<tr>
<td>1.1. Linear Facilities</td>
<td></td>
</tr>
<tr>
<td>• Traffic of vehicles only over existing roads and within</td>
<td>• Localization of disturbed land areas and</td>
</tr>
</tbody>
</table>

5.3.3 Measures for Prevention and Mitigation of Negative Impacts on Surface and Underground Waters

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<tbody>
<tr>
<td>1. Construction phase</td>
<td></td>
</tr>
<tr>
<td>1.1. Linear Facilities</td>
<td></td>
</tr>
<tr>
<td>• Traffic of vehicles only over existing roads and within</td>
<td>• Localization of disturbed land areas and</td>
</tr>
</tbody>
</table>
Measures to be taken | Expected results
---|---
the right-of-way. | minimization of impact of machinery on the surrounding environment.

- It is prohibited to wash machinery in watercourses. | Elimination of direct release of pollutants (including oil products) into surface water bodies.

1.2. Areal Facilities of Stage 1

- Removal of sanitary wastewater during the construction phase into septic tanks with subsequent pumping and transportation to the nearest receiving manholes of the existing sewerage network of OAO “Nizhnekamsk Neftekhim”. | Minimization of release of contaminated wastewater into surface and underground water bodies.

- Storm water runoff from the graded site. During construction phase approximately 35,000 m³/day of storm water will be drained from the site. This quantity may vary not only depending on weather conditions, but also in the course of paving of areas and roads. | Minimization of release of contaminated wastewater into surface and underground water bodies.

- All construction and installation work will be carried out only within the right-of-way. | Localization of disturbed land areas and minimization of impact of machinery on the surrounding environment.

- Traffic of vehicles only over existing roads and within the right-of-way. | Localization of disturbed land areas and minimization of impact of machinery on the surrounding environment.

- It is prohibited to wash machinery in watercourses. | Elimination of direct release of pollutants (including oil products) into surface water bodies.

- Any temporary areas used for parking of machinery, storage of materials and waste and settling pits will be located outside of water protection zones of water bodies. | Elimination of direct release of pollutants (including oil products) into surface water bodies.

- Collection of sanitary wastewater in sealed tanks and transportation to the nearest treatment facilities. Conclusion of agreements for sanitary wastewater removal and treatment with the owners of wastewater treatment facilities. | Minimization of release of contaminated wastewater into surface and underground water bodies.

- Timely and reliable drainage of contaminated surface runoff from the construction site. | Minimization of release of contaminated wastewater into surface and underground water bodies.

- Discharge of wastewater from hydraulic testing to settling pits, which should have proper hydraulic insulation and containment bunding. | Minimization of release of contaminated wastewater into surface and underground water bodies.


- Reclamation of coastal areas and water protection zones of water bodies after completion of work. | Minimization of release of suspended matter into surface water bodies.

- Routine monitoring of water quality in crossed watercourses during construction and installation work. | Timely identification of emergency situations relating to contamination of watercourses and prompt response to such situations.

- Appointment of persons (managers of construction | Permanent supervision over compliance with all
<table>
<thead>
<tr>
<th>Measures to be taken</th>
<th>Expected results</th>
</tr>
</thead>
<tbody>
<tr>
<td>divisions) to be responsible for implementation of measures aimed at protection of surface and underground waters against contamination.</td>
<td>water protection requirements.</td>
</tr>
<tr>
<td>• Use of a water recycling system.</td>
<td>• Minimization of fresh river water consumption.</td>
</tr>
<tr>
<td>• Minimization of wastewater volume generated in the course of construction work.</td>
<td>• Minimization of release of contaminated wastewater into surface and underground water bodies.</td>
</tr>
</tbody>
</table>

1.3. Dock Chamber

<table>
<thead>
<tr>
<th>Measures to be taken</th>
<th>Expected results</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Prohibition of any unjustified movement of machinery and mechanisms in floodplain areas and especially within the coastal area.</td>
<td>• Minimization of release of suspended matter into surface watercourses.</td>
</tr>
<tr>
<td>• Removal of any structures and equipment, backfilling of trenches after the construction work completion.</td>
<td>• Prevention of contamination with construction debris and waste and restoration of the natural regime of groundwater streams.</td>
</tr>
<tr>
<td>• Reclamation of all areas disturbed in the course of construction.</td>
<td>• Minimization of release of suspended matter into surface watercourses.</td>
</tr>
<tr>
<td>• Dismantling of temporary dams; restoration of natural relief forms; grading of river bottom and coastline after construction completion.</td>
<td>• Restoration of the river ecosystem.</td>
</tr>
<tr>
<td>• Installation of biotoilets in areas of construction work.</td>
<td>• Prevention of contamination with sanitary wastewater.</td>
</tr>
</tbody>
</table>

2. Operation Phase

2.1. Linear Facilities

2.1.1. Motor roads:

<table>
<thead>
<tr>
<th>Measures to be taken</th>
<th>Expected results</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Milling of the existing asphalt cover and reinforcement of paving (in case of replacement).</td>
<td>• Minimization of release of suspended matter into surface watercourses.</td>
</tr>
<tr>
<td>• Use of well-draining non-heaving soils for embankments</td>
<td>• Minimization of saturation of the ground with water and elimination of zones of poor runoff drainage.</td>
</tr>
<tr>
<td>• Reinforcement of roadbed embankment slopes by planting grass over a fertile soil layer 0.15m thick and watering.</td>
<td>• Minimization of release of suspended matter into surface watercourses in connection with disturbance of soil and vegetative cover and intensification of erosion processes.</td>
</tr>
<tr>
<td>• Additional reinforcement of road stretches with expanded width.</td>
<td>• Minimization of release of suspended matter into surface watercourses in connection with disturbance of the roadbed integrity.</td>
</tr>
<tr>
<td>• Excavation of water-diversion ditches along embankment foot and roadside ditches in depressions.</td>
<td>• Minimization of release of suspended matter into surface watercourses.</td>
</tr>
<tr>
<td>• Construction of round reinforced concrete conduits in depressions of the terrain.</td>
<td>• Minimization of saturation of the ground with water and accumulation and stagnation of runoff water in poorly drained zones.</td>
</tr>
<tr>
<td>• Repair of inlet and outlet riverbeds and removal of garbage from them.</td>
<td>• Minimization of saturation of the ground with water and accumulation and stagnation of runoff water in poorly drained zones.</td>
</tr>
</tbody>
</table>

2.1.2. Railroad tracks:

<table>
<thead>
<tr>
<th>Measures to be taken</th>
<th>Expected results</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Release of wastewater from the offsite networks into</td>
<td>• Minimization of release of contaminated wastewater.</td>
</tr>
<tr>
<td>Measures to be taken</td>
<td>Expected results</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>the sewerage system of Stage 1</td>
<td>to surface watercourses and underground waters.</td>
</tr>
<tr>
<td>• Replacement of soil in the base of the road bed with 0.8m thick well-draining soil layer.</td>
<td>• Minimization of saturation of the ground with water and elimination of zones of poor runoff drainage.</td>
</tr>
<tr>
<td>• Installation of water-diversion drainage launders up to 1.5m deep along railroad tracks with outlets from the industrial and storm water runoff drainage system of Stage 1.</td>
<td>• Minimization of release of contaminated wastewater into surface watercourses and underground waters.</td>
</tr>
<tr>
<td>• Installation of conduits on surfaces with adequate hydraulic insulation (slightly water-logged sandstone and semi-solid and solid clay)</td>
<td>• Minimization of release of contaminated wastewater into surface watercourses and underground waters.</td>
</tr>
<tr>
<td>• Local treatment of industrial and storm water runoff. Buffer tanks will be used as local treatment facilities, in which runoff water will undergo settling of mechanical impurities. After settling the water will be released into the existing surface runoff sewer network.</td>
<td>• Minimization of release of contaminated wastewater into surface watercourses and underground waters.</td>
</tr>
</tbody>
</table>

2.2. Areal Facilities of Stage 1

2.2.1. Production installations and associated facilities

<table>
<thead>
<tr>
<th>Measures to be taken</th>
<th>Expected results</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Improvement of the site to prevent contamination of roads, driveways and passageways.</td>
<td>• Minimization of release of contaminated wastewater into surface watercourses and underground waters.</td>
</tr>
<tr>
<td>• Reasonable layout of production equipment.</td>
<td>• Minimization of probability of emergency situations and oil spills.</td>
</tr>
<tr>
<td>• Training and examination of the operating personnel in safety issues and preparedness for emergency prevention and response.</td>
<td>• Minimization of probability of emergency situations and oil spills.</td>
</tr>
<tr>
<td>• Use of reliable and regularly verified monitoring and measuring instruments, devices and anti-accident protection means.</td>
<td>• Minimization of probability of emergency situations and oil spills.</td>
</tr>
<tr>
<td>• Use of sealed quick-operating shutoff and adjustment valves and containment means.</td>
<td>• Minimization of probability of emergency situations and oil spills.</td>
</tr>
<tr>
<td>The following special oil spill response measures will be provided:</td>
<td>• Minimization of damage to the natural environment, and in particular to water bodies in case of potential oil spills.</td>
</tr>
<tr>
<td>• A reserve of sand and means for accidental oil spill elimination and clean-up will be kept in areas of petroleum product dispensing;</td>
<td></td>
</tr>
<tr>
<td>• Oil spill prevention means will be kept intact and repaired in time, if required.</td>
<td></td>
</tr>
<tr>
<td>In the process of repair work:</td>
<td>• Minimization of probability of emergency situations and oil spills.</td>
</tr>
<tr>
<td>• All installations and equipment will be repaired in strict compliance with the relevant manuals and technical specifications;</td>
<td>• Minimization of damage to the natural environment, and in particular in the course of repair work.</td>
</tr>
<tr>
<td>• Pits and trenches excavated in the course of repairs should be backfilled after the completion of repairs.</td>
<td></td>
</tr>
<tr>
<td>• Hydraulic insulation, collection and adequate treatment of wastewater prior to release to the Kama River in the course of operation of water supply and</td>
<td>• Minimization of probability of contamination of the Kama River in the process of discharge of treated sanitary, industrial and storm water.</td>
</tr>
</tbody>
</table>
### Measures to be taken and Expected results

<table>
<thead>
<tr>
<th>Measures to be taken</th>
<th>Expected results</th>
</tr>
</thead>
<tbody>
<tr>
<td>wastewater removal systems.</td>
<td>Containment of effluents and minimization of contamination of surface and underground waters with effluents.</td>
</tr>
<tr>
<td>• Provision of water-diversion ditches in areas of office and amenity buildings.</td>
<td>Containment of effluents and minimization of contamination of surface and underground waters with effluents.</td>
</tr>
<tr>
<td>• Provision of water-diversion ditches for storm water and snow-melt water drainage from areas free from any buildings along roads.</td>
<td>Minimization of probability of migration of suspended matter, fuel and lubricants to surface watercourses.</td>
</tr>
</tbody>
</table>

#### 1.2.2. Landfill for industrial waste disposal

<table>
<thead>
<tr>
<th>Measures to be taken</th>
<th>Expected results</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Provision of bottom liner</td>
<td>Prevention of leachate migration to groundwater</td>
</tr>
<tr>
<td>• Leachate collection and treatment</td>
<td>Prevention of leachate migration to groundwater</td>
</tr>
<tr>
<td>• Monitoring of surface runoff streams</td>
<td>Monitoring of migration of leachate to the upper reaches of the creek (in the southern part of the landfill) tributary to the Klaylinka River belonging to the Kama River basin.</td>
</tr>
</tbody>
</table>

#### 1.3. Loading Dock Chamber

<table>
<thead>
<tr>
<th>Measures to be taken</th>
<th>Expected results</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Creation of gradual differences in levels and increase in the stream flow rate in comparison with the natural flow rates.</td>
<td>Minimization of probability of ruptures of tubes leading to the dock chamber.</td>
</tr>
<tr>
<td>• Compliance with the special requirements within the water protection zone (a set of environmental protection measures).</td>
<td>Improvement of hydrologic, hydrochemical, hydrobiological, sanitary and environmental condition of water bodies and improvement of the coastal areas.</td>
</tr>
<tr>
<td>• Planting of trees, shrubs or grass to create a coastal protective strip.</td>
<td>Minimization of possibility of release of suspended matter to surface watercourses.</td>
</tr>
</tbody>
</table>

We are of the opinion that all the above listed measures to be implemented in the course of construction and operation of the Oil Refinery are adequate and efficient to mitigate potential impacts on the environment.

### 5.4 IMPACTS ON GEOLOGICAL ENVIRONMENT. INTENSIFICATION OF HAZARDOUS GEOLOGICAL PROCESSES AND THEIR NEGATIVE IMPACTS DURING CONSTRUCTION AND OPERATION OF STAGE 1

The surface relief of the area selected for the Stage 1 facilities construction is divided by the valleys of the Zai, Uaratma, Osha, Kuchuy and partially Sheshma rivers. The Zai River cuts the northern extremety of the Bugulma-Belebeyevo upland into individual ridges. The northern ridges descend gradually toward the Kama River valley. In general, the overall slope direction is from south-east toward north-west.

The highest part is located in the south-eastern portion of the area, where the minimum absolute elevations in elementary river basins vary from 78m to 174m and the maximum elevations are 220-230m. In the rest of the area, the minimum
absolute elevations are predominantly 60-61m and the maximum elevations are
distributed in the following way: 200-220m in the eastern and north-eastern parts,
as well as in the area between the Osha and Uratma rivers; 180-200m in the
central part (i.e. between the Uratma and Zai rivers); and 140-180m in the western
and north-western parts of the area.

In the geomorphologic respect, the construction site itself is associated with the
catchment area of the Kama and Zai rivers and is cut by a nameless creek
tributary to the Avlazhka River, which is in turn a tributary to the Zycha River.
The topography of the site is relatively smooth, with a slight slope eastwards
toward the nameless creek, with absolute elevations varying between 205.0m and
190.0m.

The surface water runoff (storm water and snow-melt water) from the most of the
site will be drained easily, but in the northern, north-western and north-eastern
parts of the site, where the surface relief is disturbed by roads, storm water and
snow-melt water runoff drainage is blocked, although no swamping has been
reported so far.

There is no hydrographic network directly on the project construction site. The
Kama River flows at a distance of 10km to 15km to the north and west of the site.

The following unfavorable factors should be mentioned: the presence of Upper
Permian eluvial unevenly weathered rocks in the western and south-western
parts of the site; soils with low bearing capacity; periodic occurrence of irregular
shallow temporary water (verkhovodka) in the upper portion of the cross-section;
saturation of the ground with underground water in some areas; erosion caused
by water on gulley slopes; and strong and excessive heaving of clayey ground
when freezing. [Hence the natural stability of the ground for the construction
purposes is not sufficient and requires additional engineering measures. There
are two main groups of measures:

- while levelling the special gravel, drain will be provided for water
  drainage from the site;
- to ensure the stability of the buildings and facilities, pile foundation
  construction will be used with piles embedding down to stable ground
  levels.

According to the results of a standard chemical analysis of an underground
water sample, the underground water is under natural conditions slightly
corrosive due to its pH value with respect to concrete. As for its chemical
composition, it is of hydrocarbonate-calcium type with a salinity of 0.535 g/l.

Engineering geological conditions

The geological lithological structure of the site down to the depth exposed by drill
holes consists of Quaternary eluvial-deluvial (edQ_{1-2}) deposits overlying the
Upper Permian eluvial deposits (еР_{2}t) in a stratigraphically non-conforming
manner and overlaid by the surface soil and vegetative layer up to 0.1 m to 5.3 m
thick.

The Quaternary deposits are composed of clay varieties and non-subsiding sandy
silts of solid to fluid consistency, non-subsiding clays of solid, semi-solid and
tough-plastic consistency. Sand varieties occur only in the form of interbeds and lenses.

The Quaternary clay cover has a thickness from 0.3m to 2.4m in the western and south-western part of the site, increasing up to 11.5m in its central part and up to 14.8m in the northern, eastern and south-eastern parts of the site. The hypsometric surface of the Quaternary deposit roof is uneven with a slope from south-west and west northwards (western part of the site) and eastward varying from 197.31m to 205.48m in the west and up to 190.06m in the east.

In the Upper Permian eluvial deposits, there is an erosion paleointrusion filled with Quaternary clays and sandy silts.

The roof of the Upper Permian eluvial deposits has also a slope from west and south-west northward (in the west of the site) and eastward. The absolute elevations in the south and south-west of the site are 204.78 – 194.24 m lowering down to 175.57 m in the east.

In the north-eastern part of the site there is a dip of the Upper Permian deposit roof in the reverse direction, i.e. from north-east westward.

The exposed thickness of the Upper Permian deposits is from 0.2-0.5m to 6.0m and in the eastern and central parts of the site and up to 14.3m in the western and south-western parts of the site.

The Upper Permian eluvial deposits are composed of fine- and micrograin sandstones with clayey cement, weak, often weathered to a condition of sand, sometimes with interlayers of medium strength, greenish-brown, grey, brownish and reddish-brown, free of water and water-bearing; and solid clays, brown, dark- and reddish-brown, with interlayers of siltstone, limestone and sandstone.

The construction site has some positive properties:
- Absence of any hazardous physical geological processes and phenomena;
- Absence of main specific soil properties in the natural foundation (subsidence, swelling, salinity, silt and peat content, etc.);
- The site is not exposed to flooding by surface water bodies;
- Low corrosive properties of soils in relation to lead and aluminum cable sheathing.

At the same time, some negative factors were identified in the course of the engineering geological survey, which are to be taken into account during the project design development:
- Saturation of the ground with underground waters with a predicted increase of the underground water level up to 1.50m beneath the day surface level after the site grading;
- Presence of weak ground with low bearing capacity within the zone of natural foundation;
- Presence of non-uniformly weathered eluvial Upper Permian sandstones and clays;
- Poor drainage of surface runoff (storm water and snow-melt water) over a considerable part of the site;
- Low corrosiveness of underground waters with respect to pH values in relation to concrete with normal water permeability W4;
- Frost heaving of soils in case of ground freezing when having an elevated moisture content from autumn due to natural or man-made conditions;
- Actual maximum depth of ground freezing of 1.9m to 2.0m against the rated freezing depth of 1.7 according to the construction norms for the given region.

The current design contains all adequate and efficient measures to prevent negative effects of listed above factors. As mentioned above such measures will include two main groups (special gravel drain and pile foundation construction).

No hazardous physical geological processes and phenomena (erosion, landslides, suffosion, karsts, etc.) have been reported, which could have a negative impact on the stability of shallow and deep soil.

According to SNiP 2.0115-90 “Engineering protection of territories, buildings and facilities against hazardous geological processes. General provisions for design development”, the degree of hazard of exogenous geological processes in relation to construction of the planned facilities in the given area may be assessed as low.

During the construction phase, Stage 1 (mainly in connection with construction of auxiliary facilities) will cause an impact on the subsurface geological environment due to excavation of pits and trenches. After the construction completion, all excavations will be backfilled and graded. When removing the fertile topsoil layer in areas with slopes steeper than 5°, erosion processes might be initiated.

Also during the construction phase, when preparing the site for construction, it is planned to fill the gulley crossing the site from north-east to south-west and located in the area designated for storage tanks for liquefied hydrocarbon gas and pump stations for commercial petroleum products. It is planned to use natural sand and gravel mixture for backfilling the gulley. Water will be drained via a gravel drain of trench type to an existing gulley. In general, the grading design for the construction site has received a positive statement from the state review department (No.621-08/GGE-5607/02).

The current design contains all adequate and efficient measures to prevent negative impacts on the geological environment in the course of the Stage 1 facilities construction and operation and will not cause any intensification of geological phenomena.
5.5 Waste Management during Construction and Operation of the Stage 1 Facilities

5.5.1 Waste Nomenclature, Classification and Assessment of Waste Generation Amounts

Types and Characterization of Generated Wastes
Waste types that can be generated at different stages of project implementation have been identified based on an analysis of technological processes and equipment used, as well as the available data relating to similar construction projects.

For most types of the identified common wastes, the hazard class was determined in conformity with the Russian Federal Waste Classification Catalogue (RFWCC). A hazard class was assigned tentatively to any waste generated by the Oil Refinery, which are not included in the RFWCC.

The classification of each waste should be conducted with use of both computational and experimental techniques reviewed once the Oil Refinery is commissioned and the wastes are actually generated. The computational method is based on the use of environmental and hygienic parameters (MPC) of waste components. The experimental method is based on biotesting.

The inventory of wastes to be generated during construction and operation is summarized in a combined list presented in Appendix 1 Table 1 (Characterization of wastes expected during the construction phase of the Stage 1) and Table 2 (Characterization of wastes expected during the operation phase of the Stage 1). The tables contain also approximate physicochemical characteristics of wastes, which generation is expected in the process of the project implementation. Appearance of any new waste type should be immediately reflected in the corresponding documentation of the Oil Refinery.

Assessment of Waste Generation Amounts
The amount of waste is determined based on a computational analytical technique using standard methods, specific indicators and waste generation norms, as well as technical specifications provided by equipment manufacturers and operating data of similar equipment. The specific waste generation indicators and norms mean the quantities or proportion of wastes generated per unit of used materials, unit of equipment or per one employee.

Estimation of the waste amounts expected during the project implementation (i.e. during construction and operation phases of the Oil Refinery) are given in Appendix 1 Table 3 (Predicted amounts of waste generation during operation of

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*Physicochemical characteristics of wastes can change significantly as a result of changes in technological parameters of equipment that will be actually used in the process of the Complex operation.*
Stage I) and Table 4 (Predicted trends of waste generation of different hazard classes during the first 25 years of operation of the Complex Stage 1).

It should be pointed out that the estimation of quantities of generated waste may evolve as some design solutions and process specifications might be modified in the process of construction and operation resulting in changes in quantitative waste characteristics. As explained above, characteristics and quantities of waste should be reassessed once the Refinery is put in operation (see par. 3.1, Table 8.1).

For the construction phase it is necessary to determine the exact location, dimensions and characteristics of areas which will be used for accumulation and short-term storage of wastes. It is required to ensure monitoring of the use of such areas to prevent soil and groundwater contamination and to ensure timely removal of wastes for recycling or disposal (see par 3.2, Table 8.1).

Such a reassessment will permit to make timely adjustments in the future with respect to the following parameters:

- Capacities of areas for short-term onsite waste accumulation and storage;
- Optimal ways for further waste handling and removal from industrial and constructions sites;
- Provisions in agreements with construction contractors relating to waste management during the construction phase and waste removal from construction sites.
- Required useful capacities of landfills for waste disposal.

**Brief Conclusions**

An analysis of waste lists for the construction and operation phases of Stage 1, as well as forecasted assessments of waste generation suggests the following conclusions:

**During the construction phase:**

- generated wastes will be virtually non-hazardous (hazard class V) and low hazardous waste (hazard class IV) generated as a result of construction and installation work, as well as domestic garbage generated in temporary accommodation camps for construction workers.

**During the operation phase:**

- The average amount of waste generation will be 4,600 t/year. This level will be reached by Year 4 of operation.
- Under normal operating conditions, ruling out any accidental oil spills, the largest amounts of waste generation are expected during Years 5, 10, 15, 20 and 25 as according to the design data, additional amounts of wastes of Hazard Classes II and V will be generated every 5 years in relation to spent catalysts.

Classification and quantitative assessment of generated wastes provided in the project design is a sufficient basis for future waste management planning and implementation, minimization of environmental impact to an acceptable level.
However management plan should be updated during design development phase and reviewed once the Oil Refinery is commissioned.

5.5.2 Main Waste Management Methods

All types of waste generated during the construction and operation phases of the Oil Refinery are divided into a number of waste streams (groups of wastes requiring common handling methods, i.e. re-use, decontamination/processing, authorized disposal, etc.).

The project design defines the following waste handling methods:

- Supply of wastes to external licensed organizations for processing, recycling and decontamination;
- Supply of wastes to external licensed organizations for regeneration;
- Decontamination of waste at the Company’s own facilities (sludge pond and a waste incinerator);
- Disposal of wastes at municipal landfills;
- Supply of wastes for decontamination and disposal in a special landfill for hazardous industrial waste (see subsection “Landfill for Industrial Wastes”).

An appropriate waste management method for specific waste types is selected taking into account the following main factors:

- Russian regulatory and legal constrains for a given type of waste. For example, it is permitted to dispose of only a limited range of waste in municipal landfills; there are regulations requiring that certain waste types are subject to compulsory processing because they are rated as secondary resources;
- Economic viability of a specific method. A certain type of waste can have potential value as secondary resource, but the lack of consumers for this type of resource makes its processing economically ineffective;
- Capacities of the existing regional infrastructure for waste recycling, processing and decontamination.

Supply of specific waste types to external organizations for decontamination (i.e. to reduce their hazard class) is an important method leading to a reduction in the amounts of wastes to be disposed of and mitigating thereby the environmental impact of waste in the area of the project implementation.

Supply of Wastes to External Licensed Organizations for Processing and Decontamination

Supply of waste for processing and decontamination depends, first of all, on the condition and capacities of the regional infrastructure for waste processing.

A compulsory pre-condition for supply of waste to external organizations is the fact that such an organization has a license entitling it to carry out activities associated with waste handling.
Construction contractors, operators of industrial facilities including TANECO will supply to external licensed organizations the following types of waste for processing and decontamination:

**During construction phase of Stage 1:**
- Wiping materials contaminated with oils (oily wiping rags) with an oil content of 15% or more;
- Ferrous scrap;
- Residues of steel welding electrodes;
- Unsorted carbon steel scrap;
- Clean natural wooden waste;
- Unsorted galvanized steel scrap;
- Spent lead batteries with electrolyte;
- Waste of organic solvents, paints, varnish, glue, mastics and resins (paint waste with containers).

**During operation phase of Stage 1:**
- Spent industrial oils.

Furthermore, the construction contractors, operators including TANECO should ensure supply for decontamination of highly hazardous wastes (Hazard Class I). This refers to the following waste types:
- Spent and rejected mercury-containing luminescent tubes and bulbs;
- Bottom product of solvent regenerator.

The average annual amount of waste to be sent for processing and recycling during the operation phase of Stage 1 facilities is expected at 7.8 t per year. A list of waste and predicted trends in generation of waste subject to processing are given in Table 5 Appendix 1 (List and predicted amounts of waste subject to processing and recycling during the operation phase of Stage I facilities).

Prior to supply of wastes for processing/decontamination, the construction contractor/operator of industrial facilities will ensure accumulation of a certain quantity of waste suitable for transportation in areas designated for short-term waste storage in compliance with the applicable Russian norms (see subsection “Organization of Short-term Onsite Storage of Wastes”).

According to the specific procedure applied in Russia with respect to payment of fees for waste disposal, recycling, processing and decontamination, supply of wastes should be performed at least once per year with a minimum quantity left over onsite at the end of a year.

TANECO has started identifying such external companies in Russia and will develop its waste management plan in relation to the waste for outside processing and decontamination.

**Supply of Wastes to External Licensed Organizations for Regeneration**

Regeneration means the process of restoration of initial properties lost in the course of use of catalysts and absorbing agents.
During construction phase of Stage 1 facilities: 
No supply of wastes for regeneration is planned.

During operation of Stage 1 facilities:
The project design provides for return of spent catalysts and absorbing agents to the respective manufacturers for regeneration. A complete list of wastes to be returned to licensed organizations for regeneration during the operation of the Stage 1 facilities, as well as the data referring to anticipated amounts of generation of this type of wastes is given in Table 6 of Appendix 1 (List and predicted amounts of wastes subject to regeneration during operation phase of Stage 1 facilities).

The average amount of waste to be regenerated during the operation of the Stage 1 facilities will be approximately 8 t annually (during 25 years).

The project design materials do no contain any document confirming that spent catalysts and absorbing agents could be sent back to equipment suppliers for regeneration. In this connection (see par. 3.3, Table 8.1) it is required to:

- Obtain from equipment suppliers a confirmation that they will receive this type of waste for regeneration;
- Provide a possibility and elaborate a procedure for supply of spent catalysts and absorbing agents for regeneration.

TANECO will meet these requirements during the ESMP implementation.

Decontamination of Wastes at the Company’s own Facilities

During the construction phase:
According to the project design, no waste decontamination will be carried out at the Company’s facilities during the construction phase.

During the operation:
The project design provides for the use of a waste incinerator during the operation phase of the Oil Refinery. A list of waste types subject to incineration is given in Table 7 Appendix 1 (List of wastes to be incinerated during operation phase of Stage I facilities).

The waste generated as a result incineration operation will be disposed in a landfill for industrial wastes outside of the construction site.

It is planned to use a tank for short-term sludge storage.

Thus, it will be necessary to specify the following data during the detailed engineering design development (see par. 3.4 , Table 8.1):

- Technological characteristics of the waste incinerator: amount of waste to be handled, amount and characteristics of waste generated as a result of waste incineration.

Waste Disposal at Municipal Landfills
The following waste types of Hazard Classes IV and V will be disposed of in an authorized way at municipal landfills:
During the construction phase:
- Broken concrete elements, concrete waste in lump form;
- Broken reinforced concrete elements, reinforced concrete waste in lump form;
- Concrete mixture waste with a dust content of less than 30%;
- Wooden waste from construction, including demolition and dismantling of old structures;
- Wooden sawdust contaminated with mineral oils (oil content less than 15%);
- Waste paints;
- Waste containing carbon steel in lump form;
- Superfine basalt fiber waste;
- Welding cinder;
- Waste of wires and cables with insulation;
- Construction-grade broken stone not suitable for use;
- Clean natural wood cuttings;
- Waste sand not contaminated with hazardous substances;
- Light-weight concrete aggregate in lump form;
- Cement dust;
- Waste cement in lump form;
- Waste bitumen and asphalt in solid form;
- Waste asphalt concrete and/or asphalt concrete mixture in lump form;
- Glass fiber waste;
- Waste of ruberoid (roofing tarred paper);
- Garbage from general amenity facilities, unsorted (except for bulky garbage).

During the operation phase:
- Garbage from general amenity facilities, unsorted (except for bulky garbage).
- Street sweepings.

A list of wastes and data referring to expected amounts of waste to be removed to municipal landfills is given in Table 8 Appendix 1 (List and predicted amounts of waste to be disposed at municipal landfills during the operation phase of Stage 1 facilities).

A list and characteristics of wastes, which can be additionally removed for disposal in municipal landfills, are given in the subsection “Main Methods of Waste Management” (Brief Conclusions).

Russian Sanitary Rules SP 2.1.7.1038-01 allow for a disposal of certain types of industrial wastes at municipal landfills. Main requirement for such disposal is that the toxicity of a mixture of industrial and municipal wastes should not exceed the toxicity of municipal wastes.
Toxicity is determined by aqueous extract analysis:

- Industrial waste of Class IV of Toxicity*, accepted for disposal in municipal landfills without limitations with respect to quantities, is characterized by concentrations of toxic substances in aqueous extract (1 liter of water per 1 kg of waste) at a level similar to that of leachate from solid domestic wastes and by integrated indicators, i.e. biochemical oxygen demand (BOD_{total}) and chemical oxygen demand (COD) not higher than 300 mg/l, and uniform structure with size fractions of less than 250 mm;

- Industrial waste of Classes IV and III of Toxicity accepted in limited quantities (not more than 30% of the mass of municipal solid waste) and stored together with municipal waste, is characterized by concentrations in aqueous extract at a level similar to that of leachate from solid domestic wastes and COD_{20} and COD values of 3400 to 5000 mg/l O_2.

The final decision to accept quantities and types of wastes for disposal at a municipal landfill is taken by the landfill operator and with approval of the territorial division of the Rospotrebnadzor Agency. A sanitary epidemiological statement for joint storage and disposal of industrial and municipal wastes is to be issued by the territorial division of the Rospotrebnadzor Agency on the basis of aqueous extract analyses of actual wastes. Analytical investigation of aqueous extract is to be performed by a duly accredited laboratory.

Waste disposal at municipal landfills is also subject to approval by the administration of the district, where a given landfill is located (see par 3.5 of Table 8.1).

The use of municipal landfills for industrial waste disposal during the operation phase of Stage I facilities is also considered in subsection “Brief Conclusions” in Section “Main Waste Management Methods”

Transportation of waste to landfills shall be carried out in compliance with the applicable requirements by special vehicles to be provided by the construction contractor / operator of industrial facilities or by an external specialist organization on contractual basis.

Prior to removal of waste from the site for disposal in municipal landfills, the construction contractor, operator of industrial facilities including TANECO will ensure accumulation of a certain quantity of waste suitable for transportation in areas designated for short-term waste storage in compliance with the applicable Russian norms (see subsection “Organization of Short-term Onsite Storage of Wastes”).

* According to the classification of the RF Ministry of Health.
Supply of Wastes for Decontamination and Disposal in a Landfill for Industrial Wastes

Any hazardous industrial waste generated during the operation phase of the Oil Refinery should be sent to a landfill for industrial waste disposal (See subsection “Landfill for Industrial Waste Disposal”).

During the construction phase:

The landfill for industrial waste disposal will not be used during the construction phase.

During the operation phase:

According to the Sanitary Rules SP 2.1.7.1038-01, solid and paste-like hazardous industrial wastes containing toxic substances, heavy metals, inflammable and explosive substances should be disposed of in special landfills designed for industrial waste decontamination and disposal.

A summary of the data available in the design materials and referring to industrial waste generation with a breakdown by hazard classes is presented in Tables 9 (List and prognosticated amounts of waste to be disposed of in an landfill for industrial waste during the operation phase of Stage 1 facilities) and 10 Appendix 1 (Prognosticated trends of waste generation of different hazard classes to be disposed of in an industrial waste landfill during the operation phase of Stage 1 facilities).

Due to delays with detailed engineering design development and subsequent construction of a landfill for industrial waste disposal, it can be commissioned after the Oil Refinery’s commissioning.

In this connection it appears necessary to identify other options of hazardous industrial waste disposal (see par 3.6 of Table 8.1):

- Supply of industrial wastes of Hazard Classes II and III for disposal in existing landfills for industrial waste within the Lower Kama industrial zone;
- Supply of industrial wastes of Hazard Classes II and III for disposal in other landfills for industrial waste;
- Temporary accumulation and storage of waste on industrial sites of the Complex facilities (provided that environmental safety of areas used for centralized short-term onsite waste storage is ensured).

The capacity of the areas designated for centralized short-term onsite waste storage should be sufficient for reception of wastes during the entire period before commissioning of the Company’s landfill for industrial waste disposal.

More detailed information about the requirements for areas for centralized short-term onsite waste storage is provided in subsection “Organization of Short-term Waste Storage”.
Landfill for Industrial Waste Disposal

According to the project design, a landfill for industrial waste disposal shall be located in the north-eastern part of the site of the Complex. The landfill area is assumed to be 8.1 ha. The design service life of the landfill is 25 years.

The following issues should be specified in the process of detailed engineering design development (see par. 3.7 of Table 8.1):

- Clarification of the data referring to the density of wastes to be disposed of in the landfill to assess the required useful capacity of the landfill, its overall capacity and service life;
- Use of advanced synthetic materials for top and bottom liners;
- An additional liner should be provided on the landfill bottom in the form of a second impermeable synthetic liner, as well as other measures to prevent mechanical damage of the liners in the process of their installation and during the landfill operation due to imposed loads;
- Separate disposal of wastes of different hazard classes;
- A system for drainage and purification of leachate;
- Development and substantiation of a system for soil and groundwater contamination monitoring, as well as other environment media.

Brief Conclusions

Table 5.5-1 contains summarized information about distribution of waste streams during the operation phase.

**Table 5.5-1 Waste stream distribution during operation phase**

<table>
<thead>
<tr>
<th>Supply of waste to external organizations for processing and recycling</th>
<th>Supply of waste for regeneration</th>
<th>Waste decontamination at the Company’s own facilities</th>
<th>Waste disposal at municipal landfills</th>
<th>Waste disposal at industrial waste landfill</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2%</td>
<td>10.6%</td>
<td>11.1%</td>
<td>10.5%</td>
<td>67.6%</td>
</tr>
</tbody>
</table>

The total amount of waste generated during 25 years of operation of Stage 1 facilities to be disposed of at the landfill for industrial waste shall be 75,500 t. As can be seen from Table 5.5-1 the percentage of waste to be disposed of in this way shall be 67.7%.

To reduce the amounts of waste disposed in the landfill for industrial waste it is necessary to investigate the following alternative ways for managing some waste types (see par 3.8 of Table 8.1):

*For regeneration:*

Hazard Class III:

- Spent catalyst of CR-3S grade.

*For disposal in municipal landfills:*
Hazard Class IV:
- Ash, sludge and dust from firing chambers and from waste incinerators;
- Spent carbon filters contaminated with mineral oils (oil content less than 15%);
- Waste generated in the process of wastewater treatment and not included in other waste items (sand with residue from sand traps).

Hazard Class V:
- Ceramic waste in lump form;
- Polypropylene waste in of form of scrap and pour gates;
- Polypropylene waste in the form of film
- Spent and broken grinding wheels;
- Cotton fabric cuttings;
- Old paper and cardboard as office waste;
- Broken concrete structures in lump form;
- Broken construction-grade brick;
- Residues and cinder of welding steel electrodes.

In this case the total amount of waste generated during 25 years of operation of Stage 1 facilities to be disposed of in the industrial waste landfill shall decrease by 71,200 t and the proportion of waste to be disposed of in the industrial waste landfill shall be 3.9%.

**Table 5.5-2 Waste stream distribution during the operation phase in case of minimization of waste to be disposed of in industrial waste landfill**

<table>
<thead>
<tr>
<th>Supply of waste to external organizations for processing and recycling</th>
<th>Supply of waste for regeneration</th>
<th>Waste decontamination at the Company's own facilities</th>
<th>Waste disposal at municipal landfills</th>
<th>Waste sent additionally to municipal landfills or for regeneration, processing or recycling</th>
<th>Waste disposal at landfill for industrial waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2%</td>
<td>10.6%</td>
<td>11.1%</td>
<td>10.5%</td>
<td>63.7%</td>
<td>3.9%</td>
</tr>
</tbody>
</table>

It should be mentioned that a waste management plan to be developed shall envisage minimization waste disposal in landfill for industrial waste as much as possible.

A list of waste types and data referring to predicted amounts of waste to be disposed of at the landfill for industrial wastes (provided that an additional part of waste will be sent for recycling or disposed of in municipal landfills) is given in Table 11 Appendix 1 (Prognosticated amounts of waste to be disposed of in an industrial waste landfill in case of supply of additional amounts for regeneration/recycling or disposal at municipal landfills). The total amount of waste disposed of at the landfill for industrial waste during 25 years of operation of the Stage 1 facilities shall be in this case 4,300 t.
Thus, the use of the waste management methods considered in the project design and recommendations aimed at limitation of waste amounts to be disposed of at the landfill for industrial wastes, as well as implementation of the proposed design solutions shall ensure minimization of environmental impacts to an acceptable level.

5.5.3 **Waste Handling in Individual Production Areas**

Waste handling operations to be performed on site include the following:
- Primary treatment of waste (decontamination);
- Collection of waste;
- Primary recording of waste streams;
- Short-term onsite storage;
- Marking of containers and facilities used for short-term waste storage;
- Preparation of waste for transportation.

The waste collection procedures require separate waste collection or acceptable joint collection of certain types of waste in the same container.

The procedure for implementation of the prescribed actions is dependent to a significant degree on physicochemical characteristic of waste (contents of toxic substances, volatility, physical condition) and, in particular, on the hazard class of waste.

Primary treatment of waste is a low-cost measure of organizational/technical character aimed at mitigating the hazards posed by a given type of waste in its original condition. A simple example of primary waste treatment is washing of steel drums to remove remnants of chemicals. Primary treatment is applicable to a limited range of waste generated during construction and operation of the planned facilities.

A procedure for short-term onsite waste storage determines the type, dimensions and equipment of a facility used for collection and accumulation of specific types of waste. Furthermore, an applied short-term waste storage procedure determines the requirements set to special containers to be used for this purpose.

A necessary precondition of separate waste storage is proper marking of containers and facilities used for short-term waste storage. In addition to the description of waste, the marking should contain a warning referring to hazardous properties of specific waste types, e.g., fire hazard or toxicity.

Preparation of waste for transportation should meet the following main requirements:
- The volume of waste to be transported should be as compact as possible;
- Prevention of waste loss during transportation;
- Prevention of any accidental and emergency situations;
- Prevention of any damage to natural environment and public health.
**Short-term waste storage**

The project design materials do not contain any information about the size and number of areas to be used for short-term onsite waste storage.

In this connection, it is necessary to specify the following aspects (see par 3.9 of Table 8.1):

- List and amounts of wastes to be stored on a short-term basis on site and the expected duration of storage;
- Exact location of areas for short-term waste storage;
- Dimensions of areas and required preconditions to be provided for short-term onsite storage of different waste types.

The need for appropriate equipment of special areas to be used for short-term onsite storage of waste follows from the requirements defined in Article 10 of the RF Law “On Industrial and Consumption Waste”: in the process of design development for waste generating activities it is required to designate areas (sites) for collection (accumulation) and short-term storage of waste in compliance with the applicable waste handling rules, norms and requirements.

The requirements set for areas dedicated to short-term waste storage, as well as methods and conditions for waste accumulation and short-term storage depend on the following parameters:

- Origin of waste;
- Physical condition of waste;
- Physical properties of waste;
- Presence of any hazardous components and their proportions (Hazard Class).

Depending on waste properties, waste can be stored in bulk, in stacks or in special containers (boxes, drums, etc.).

An area and procedure for short-term waste storage should ensure the following:

- Elimination or minimization of the impact of stored waste on the surrounding environment (hydraulic insulation of the ground surface to protect it against potential spills and leaks);
- Elimination of risk of threat to human health as a result of local impact of highly toxic waste or as a result of deterioration of the sanitary epidemiological conditions caused by improper handling of waste with low toxicity;
- Inaccessibility of toxic waste for unauthorized persons;
- Prevention of loss of valuable properties of secondary raw materials as a result of improper (non-selective) collection or storage (exposure to weather conditions, non-compliance with permissible storage time, etc.);
- Minimization of risks of fire;
- Prevention of contamination of the site;
- Convenience for waste inventory and supervision over waste handling;
- Convenience for waste transportation from the site (at least absence of factors precluding compliance with the of waste removal schedule, prescribed requirements to loading/unloading operations, etc.).

In accordance with the project design materials all industrial waste generated in the course of operation of Stage 1 facilities shall be removed to a landfill for industrial waste (see subsection “Supply of waste for decontamination and disposal at the industrial waste landfill”). But as it was pointed out above, the commissioning of the landfill for industrial waste disposal may be put into operation after the Oil Refinery is commissioned.

When planning the layout of areas for short-term onsite waste storage, it should be taken into account that industrial waste subject to disposal at the landfill for industrial wastes should be stored on a temporary basis in special properly equipped areas. (see par. 3.6 of Table 8.1).

**Brief Conclusions**

Compliance with the requirements to waste handling operations in production areas and provision of facilities for short-term onsite waste storage within the framework of project planning and implementation will in the future ensure minimization of environmental impacts to an acceptable level.

### 5.5.4 Supervision over waste handling


Corresponding requirements have been defined in relation to this Project for contractor organizations, individual facilities and any other organizations involved in waste handling (transport companies and waste processing companies):

- Obligation to have a license of a license for hazardous waste handling;
- Development of a document specifying the waste generation norms and permitted waste disposal limits (WGWDL) to be approved by the territorial division of the RF Ministry of Natural Resources in accordance with the prescribed procedure;
- Submission of compulsory reports on waste generation (amounts of generated, recycled, processed and transported waste);
- Payment of waste disposal charges (for disposal within and beyond the permitted limits).

Supervision over waste handling procedures at industrial sites is to be performed in two ways:

1. Supervision by TANECO over waste handling activities of construction contractors / operators of its main industrial facilities;
2. Internal supervision at each main industrial facility of TANECO as an integral part of the routine environmental monitoring system prescribed by the RF legislation.

The issues relating to waste handling at industrial sites, as well as the required monitoring and reporting procedures should be elaborated in more detail in the Waste Management Plan (See par 3.10 of Table 8.1). This Plan should envisage minimization waste disposal at the landfill for hazardous industrial waste as much as possible. The format of a Waste Management Plan is given in Appendix 2.

5.5.5 Conclusions

The information contained in the project design for construction and operation of the Stage 1 facilities provides for a general concept of the planned waste management system, the nomenclature and physicochemical characteristics of waste, methods for waste collection, short-term onsite storage and further processing, recycling and disposal.

Provided that a number of issues will be clarified in the process of detailed engineering design development (see par 3 «Waste Management» of Table 8.1), and the measures foreseen in the Waste Management Plan will be implemented (such a Plan should be developed on the basis of the format presented in Appendix 2), waste management during the construction and operation phase of the Oil Refinery facilities should comply with the requirements to minimize their impacts to an acceptable level.

Below are the main issues identified in the process of the review of the design materials, as well as issues which require additional elaboration and measures aimed at ensuring environmental safety of operations, compliance with the requirements of the Russian legislation and the best international practices during the design development, construction and operation phases of the Stage 1 facilities.

Waste Generation

Operation phase:

1. Since the development of detailed engineering designs has not yet been completed, the exact amounts of wastes to be generated in the process of operation have not been determined (at the design development stage many operating / technological characteristics of the planned facilities were specified using the data of the similar existing operations).

Required measures:

- Clarify the list of generated waste types, their physicochemical characteristics and hazard classes (based on the results of detailed engineering and clarification of the list of equipment to be used at the planned facilities);
• After the commissioning of the Stage 1 facilities, develop and have approved according to the prescribed procedure a document specifying the waste generation norms and permitted waste disposal limits (WGWDL).

Short-term Onsite Waste Storage

Construction phase:
1. The design materials do not specify the exact location, dimensions and equipment of areas to be used for waste accumulation and short-term onsite storage.

Required measures:
• Ensure supervision over contractors’ use of areas for waste accumulation and short-term storage (including measures aimed at preventing soil and groundwater contamination);
• Ensure supervision over timely removal of wastes from the site by contractors.

Operation phase:
1. The design materials do not specify the exact location, dimensions and equipment of areas to be used for waste accumulation and short-term onsite storage.

Required measures:
• Specify the list of waste types and amounts to be stored on a temporary basis on site, as well as expected duration of storage;
• Specify the location of areas for short-term waste storage;
• Determine the dimensions of areas and conditions for short-term waste storage in accordance with waste types to be stored.

2. The design materials do not specify the exact location, dimensions and design of a sludge accumulating pond.
• Specify the volume, design and location of a sludge pond;
• Foresee use of advanced synthetic materials when developing the bottom liner design for the sludge pond.

3. No design solutions have been foreseen for short-term storage / recycling / utilization / disposal of industrial waste that will be generated during the operation phase of the Stage 1 facilities. This issue is raised in connection with the delayed design development and construction of a landfill for industrial waste disposal.

Required measures:
• Clarify the possibility to supply industrial waste for disposal in existing landfills for industrial waste within the Lower Kama industrial region;
• Clarify the possibility to supply industrial waste for disposal in other landfills for industrial waste;
• Clarify the possibility for temporary waste accumulation and storage on industrial sites of the Complex facilities (provided that environmental safety will be ensured).

Supply of waste to external organizations for processing and recycling

Operation phase of Stage 1 facilities:

• Carry out an inventory and investigate capacities of the existing regional infrastructure for waste processing and recycling.

Supply of waste to external organizations for regeneration

Operation phase of Stage 1 facilities:

1. The design materials do not provide any documented confirmation of a possibility for supply of spent catalysts and absorbing agents to equipment suppliers for regeneration.

Required measures:

• Obtain a confirmation of a possibility for reception of this waste type by the equipment suppliers;

• In order to ensure supply of waste for regeneration in amounts stated in the project design, it is necessary to foresee a possibility and procedure for supply of spent catalysts and absorbing agents in appropriate supply agreements.

Waste incineration at the Company’s own facilities

Operation phase of Stage 1 facilities:

1. The project design materials do not contain any information about technical specifications of a waste incinerator. It is required to clarify the data referring to waste generation in the course of the incinerator operation.

Required measures:

• Determine technical characteristics of the required waste incinerator, including the amount of waste to be processed and the amount and parameters of waste generated as a result of incineration.

Waste disposal at the landfill for hazardous industrial waste

Operation phase of Stage 1 facilities:

1. It is required to develop a detailed engineering design of the landfill for hazardous industrial waste disposal.

Required measures:

• Clarify the data relating to the density of waste planned for disposal in the industrial waste landfill (in order to be able to determine the required effective volume);

• Develop an engineering design of an industrial waste landfill for the entire service life of the planned Complex;

• The engineering design should provide for:
  - Use of advanced synthetic materials for the top and bottom liners;
- Installation of a secondary impermeable synthetic layer for the bottom liner in order to ensure double protection;
- Measures to prevent mechanical damage of impermeable liners (especially during their installation);
- Separate disposal of wastes of different hazard classes;
- A system for leachate collection and treatment;
- A system for monitoring soil and groundwater contamination, as well as other environment media.

2. The proportion of waste to be disposed of at the industrial waste landfill is approximately 68% of the total waste generation amount. A reduction in this proportion would prolong the landfill service life.

Required measures:
- Prepare a list of measures to be taken to decrease the waste volume sent for disposal in the industrial waste landfill. This list should include the following:
  - Decontamination (to ensure lower class of hazard);
  - Compaction (volume reduction);
  - Direct use as secondary resource;
  - Processing of some waste as secondary resources.
- Conduct an inventory and investigate possibilities of the regional waste recycling and disposal infrastructure.

Waste disposal in municipal landfills
Operation phase of Stage 1 facilities:
1. The amounts and types of waste to be disposed of in municipal landfills are subject to approval by the territorial division of the Rospotrebnadzor Agency.

Required measures:
- Have approved in the territorial division of Rospotrebnadzor in accordance with the existing procedure the amounts and types of waste to be disposed of in municipal landfills.

Waste handling supervision:
Operation phase of Stage 1 facilities:
1. No procedure and system for waste handling reporting at production sites have been elaborated.

Required measures:
- Develop and have approved a Waste Management Plan
5.6 Impacts on Soils during Stage 1 Construction and Operation

The Nizhnekamsk District area soils are characterised by elevated copper and cadmium background values. The existing anthropogenic load exceeds the soil natural purification potential and there is a risk of erosion process development, if the fertile soil layer is removed from any inclined surfaces at the angle of over 5°.

The main type of soil impacts during the Oil Refinery construction is mechanical damage related with facility building and the laying of communication and transport lines.

The natural top-soil layer is planned to be removed and stored beyond the construction area during its preparation, to be used later for in-fill in the non-constructed areas in the vicinity of the residential quarters.

Any fertile soil is planned for longer term storage in piles for subsequent use for area development. Some of the fertile soil will be sold to the public.

The major causes of negative impact on soil at the Oil Refinery construction and operation will be as follows:

At construction:

- Mechanical impact related to facility construction and the laying communication and transport lines;
- Removal and storage of the soil cover; and
- Excavation of significant soil volumes and possible bank erosion.

At operation:

- Possible waste migration to the adjacent territories and the resulting pollutant migration to the soils; and
- Filtrations and leakages related to:
  - Surface water discharge;
  - Domestic waste water discharge; and
  - Production waste water discharge.

The issues related to waste management, the risks pertaining to waste generation, temporary storage or transfer, and the measures needed to minimise their effect on the natural environment components down to the permissible level are reviewed in section 5.5.

The risks related to the issues dealing with surface, domestic and industrial waste water discharge, as well as the measures needed to minimise their effect on the environment are reviewed in detail in section 5.3.

Monitoring should be put in place to detect soil and ground pollution in a timely manner and to ensure that appropriate remedial measures are taken. The issues related to organising the monitoring and appropriate remedial measures are reviewed in section 7.
On the basis of the materials presented in the design, ERM concludes that the soil impact intensity at Stage 1 construction and operation phases is expected to be within the permissible level, provided all the measures dealing with water discharge and waste management are implemented.

5.7 IMPACTS ON VEGETATION

5.7.1 Impacts on Vegetation at Construction Phase

No protected species or rare communities entered into the RT, RF and IUCN Red Lists have been identified on the territory of the Stage 1 development. Specially protected natural areas of the Nizhnekamsk District are situated at a considerable distance from the impact zone of the facilities. The protected species will not be negatively impacted by the Oil Refinery during either the construction or operation phases. The biggest impact will consist in removal of vegetation inside the construction area, while at the facility operation phase it will consist in changing soil and air pollution levels.

External Oil Product Pipeline

The maximum impact on vegetation will be produced within the process of land preparation for facility construction: this work will involve forest felling and low woodland and bush removal which will result in transformation of the plant communities and partial destruction of the soil and vegetation layer removed. The tree removal causes microclimate changes in the vicinity of the cutover patches and results in changes to the indigenous forest ecosystem. Forest land transformation into forest-free lands will lead to the introduction of ruderal species, changing the ratio of shade and sun and encouraging the development of meadowland.

The vegetation cover will suffer a considerable impact from the process equipment, building machines and motor vehicles. This impact may be characterised as a short-term one. However, the use of heavy-duty machinery leads to a high level of vegetation damage and to considerable soil and ground compaction. The impact area on the soil and vegetation cover are limited to the construction belt of the designed structures and to access routes for vehicles and construction machinery.

Apart from the direct vegetation cover destruction within the construction zone, pollutants may be introduced by construction machines and motor vehicles.

As the facilities are planned to be situated on the agricultural lands (about 74.5%), no plant species modification will follow the completion of construction and technical and biological stages of reclamation and revegetation; the agrotechnical soil cover characteristics will be restored to the initial values.
External Oil Pipeline
During construction work the vegetation cover will be subject to mainly 'background' natural impacts: the main impacts will be vegetation cover destruction related to clearing land allocated for permanent use and vegetation cover damage on temporarily allocated land due to heavy machinery movement. These impacts will also occur in the vicinity of these plots and on access routes. The total area of the lands affected by these works will be 325.73 ha, including 59.07 ha of forest range. The impact at this type of operations is unavoidable. In general, for all the construction areas of the designed facilities, appropriate measures are provided with the objective of minimising negative impacts to the vegetation cover on land adjacent to the land allocation areas, in particular, limiting special machinery movement to the land allocation areas only. All the land allocation areas needed for the operations have been formalised under the procedures duly stipulated by law and all the compensatory payments for the damage produced have been made. Thus, the oil pipeline facility construction will not lead to deterioration of the vegetation condition in adjacent areas.

External Railway Lines
The Oil Refinery will produce impacts on the condition of vegetation cover both at the design and operation stage. The External Railway Transport facilities may result in both direct and indirect impacts. There may be negative impacts related to removal of vegetation, mechanical damages, tree cutting, soil cover damage and pollution, slowing or cessation of natural biological processes due to the impact of exhaust gases and dust and direct contact with oil products, etc. The boundaries of the area of soil and vegetation impact are limited to the construction site territory.

Off-Site Waste Water Discharge Unit
The soil and vegetation will be impacted as a result of area clearance from young growth and shrubbery, soil and vegetation layer and mineral ground cut-away along the piping route and approach venue arrangement to the construction site.

5.7.2 Impacts on Vegetation at Stage 1 Operation
During facility operation the impacts on vegetation will be related to the variance of soil and air pollution levels.

5.7.3 Measures for Prevention and Mitigation of Negative Impacts on Vegetation
Over 1.5 million tree seedlings have been planted at the initiative of OAO "Tatneft" and OAO "TANECO" at the area of 384.51 ha included in the Nizhnekamsk sanitary protection zone during the preparatory operations. The planting was undertaken within the framework of an action entitled Green Nizhnekamsk Shield and is a compensatory measure of the Oil Refinery
construction environmental programme. OAO “TANECO” plans to increase the total plantation area in the short-term to 500 ha according to the compensation schedule.

In 2006 a set of measures was also taken to improve park planning and landscape gardening in the residential block.

The design offers a set of measures to reduce the negative impacts on soil and vegetation:

- the design provides for a minimum land take;
- for the purpose of vegetation protection against fire, all the construction facilities should be equipped with firefighting systems;
- the transport movements will be limited to approved routes in the operation area;
- vegetation burning is banned;
- special sites are assigned for machinery re-fuelling and waste storage to prevent the soil and vegetation pollution; and
- after the operations are completed, the damaged lands will be reclaimed and revegetated.

5.8 **IMPACTS ON WILDLIFE**

5.8.1 **Impacts on Wildlife at Stage 1 Construction Phase**

The major impacts to wildlife during the construction phase are habitat reduction and disturbance.

The habitat transformation may be expressed by changes to the community structure. Groundworks associated with construction will result in reducing habitat areas and land productivity, which leads to a temporary relocation of certain species.

The mechanical damage to soil and vegetation cover, tree cutting, low forest and shrubbery removal and general disturbance caused by the construction operations may produce a negative effect on wildlife in the affected areas. A temporary migration of amphibians, reptiles, birds and mammals living near the construction sites is possible due to human and technical presence.

Direct deaths of individual animals caused by mechanical damage, poaching, poisoning, etc. are possible during construction work.

Disturbance and stress will occur because of construction activities. These impacts will be limited to the construction period but may produce a significant influence to nesting or chick-rearing birds, or those transiting during seasonal migrations.

Construction works will be accompanied by low-level habitat pollution. The pollution produces both direct and indirect (related to changing alimentation base, microclimatic conditions, etc.) impact on the animal populations in the construction work area.
The design provides for access route and river crossing of the Nizhnekamsk-Almetyevsk-Kstovo local oil product pipeline of the following water streams: Bryssa River, Steklets River, Kurnalka River, Martyshka River, Biklyan River, Melekeska River, Suksinka River, Kuvaldy River, Tarly River, Kargalka River, Inysh River and several unnamed water courses.

The riverbed and flood plain operations will be accompanied by higher suspended solids in water as a result of wash-down from eroded banks, as well as a direct result of mechanical impact on the channel. As a result, water transparency is reduced in the high-turbidity zone and photosynthesis impeded. Under this impact the hydrological and hydrochemical water parameters change, resistance is reduced and planktonic and benthic communities are reduced. Fish spawning and feeding grounds may be silted and the natural migration routes blocked. The risk of eutrophication increases and there is a risk of long-term irrevocable impact. At the same time, ecosystem productivity is sharply reduced, while the quality-sensitive species either abandon their traditional habitats or are replaced with other less productive ones with a lower commercial value.

In many cases the fish productivity is related to the direct physical loss of feeding or spawning grounds and to avoidance behaviours due to stress. There is also a risk of unlicensed fishing in the operation area. The spawning period is from May to June and reduction of stress inducing activities will be an objective during this time.

The assessment of damages done to the fishery resources in course of the construction was made by the Environmental Department of the Kazan State Ulyanov-Lenin University.

Compliance with the technology requirements during the operations and compensatory measures to be conducted after the construction is over, will assist in reducing the negative factor impact on the biota and the designed facility operation will not significantly affect the animal population status.

5.8.2 Impacts on Wildlife at Stage 1 Operation

The basic wildlife impact at the facility operation phase will be related to the noise effects caused by the Stage 1 operations and heavy-duty machinery and vehicles.

5.8.3 Measures for Prevention and Mitigation of Negative Impacts on Wildlife

Following the Requirements Directed at Death Prevention of Wildlife Objects during Production Processes, as well as at Operation of Transport Thoroughfares, Pipelines and Communication and Power Lines approved under RF Government Decree No. 997 of 13.08.96 and under Republic of Tatarstan Government Decree No. 669 of 15.09.2000, the design provides for the following measures aimed to reduce the wildlife impacts:
• technical training of employees in environment protection issues;
• storage and use of chemical agents, fuels, lubricants and other materials, products and production waste hazardous to wildlife and habitats should be performed with observance of the measures guaranteeing prevention of the spread of disease and death and habitat deterioration;
• limiting animal access to the process sites by installing fencing around the designed sites;
• ban imposed on use of any technologies and mechanisms, which may cause significant death rates to wildlife;
• building work exclusion during the animal reproduction period;
• ensuring control of engine noise insulation integrity with regard to building machines and motor vehicles, timely maintenance to reduce noise levels produced by machinery in operation;
• after conducting operations in stream beds, the damaged section will be restored to its natural state;
• restrain from operations in the fish egg-laying period (May to June);
• ban imposed on pollutant discharge to water bodies; and
• The intake pipeline of the pump supplying water for production purposes should be equipped with a fish protection mesh filter with 1.5 by 1.5 mm cells to exclude fish fry being sucked into the intake pipeline.

If the nature protection requirements are met to the full extent during the Stage 1 construction and operation, the impacts on vegetation and wildlife will remain within the background indicators limits.

5.9

**Potential Levels of Harmful Physical Impacts Factors on Adjacent Areas**

The main significant physical factor during the construction process will be noise pollution.

*At construction of Stage 1 facilities:*

In the construction period the basic noise impact will be related to the operations of machinery and motor vehicles engaged in building and installation work.

*At operation of Stage 1 facilities:*

At the period of the Stage 1 operation the noise impact will be produced by pumping and compressor units, loudspeakers, air cooling units (ventilators), intake and exhaust ventilation systems, gas and steam turbines, disposal furnaces and incoming and outgoing railway trains.

During operation, the production noise levels should not exceed the maximum permissible noise level of 85 dBA at the distance of 1 m away and at the height of 1.5 m set for workposts.
For the purpose of reducing the noise from operating process equipment, the design provides for the following measures:

- New equipment selection will be done with regard to the existing workpost noise limitation of 85 dBA in production premises;
- High noise level units will as far as possible be located in fully automated blocks, which do not require a permanent servicing personnel presence;
- Equipment will be fitted with noise suppression devices, silencers and noise insulation;
- There are provisions in place for timely equipment maintenance, forced friction surface lubrication and rotation part balancing adjustment; and
- Noise protection screens and personal hearing protection equipment will be used at workposts for personnel protection.

A conclusion can be made on the basis of the results of noise pressure level assessment that the acoustic discomfort caused by the Oil Refinery and infrastructure facility noise sources is limited by the production site boundaries. The acoustic assessment for Stage 1 prepared without taking into account the sound absorption and acoustic wave reflection by the concrete plant fencing, relief elements and green plantations shows that:

- The workpost and adjacent territory noise levels do not exceed the standards contained in SNiP (CS&R) II-12-77 Noise Protection and SS 2.24/2.1.8562-96 Noise at Workposts, in Residential & Public Building Premises & in Residential Areas.
- The noise level produced by the infrastructure facilities is insignificant and does not exceed the sanitary and hygienic standards in place for residential areas (specific sound pressure indicator does not exceed 45 dBA for night time). The noise is mainly concentrated on the production zone territory and does not spread beyond the sanitary protection zone. No additional residential space protection is required against the acoustic impact.

The units of Stage 1 under construction have no sources of ionising radiation and electromagnetic fields.

The design material analysis enables to conclude that the harmful physical impact levels at Stage 1 construction and operation will be within the permissible level range.

5.10 IMPACTS ON PUBLIC HEALTH IN ADJACENT AREAS

The Oil Refinery construction will be carried out in the Nizhnekamsk Industrial Zone.

Communities are situated in close proximity of the USPZ boundaries of the Nizhnekamsk Industrial Zone: to the north – Prosti settlement; to the south east –
Avlash settlement; to the south – Ishteryakovo village; to the south-west Balchikly settlement orchards, Balchikly settlement and Klyatle village; to the west – Stroiteley township (orchards); and to the north-west – residential area of Nizhnekamsk City. The settlement of Martysh (in the south-east) and the village of Alan (in the south-west) are located within the USPZ.

In 2007 the OOO “Centre for Public Environmental Safety” (from the city of Perm) performed operations in the sphere of Health Risk Assessment of the Public Related to the Operation of the Nizhnekamsk Industrial Zone & OAO “TANECO”. A conclusion was made during the analysis of the whole Complex operation of possible exposure routes for hazardous chemicals to impact neighbours. The conclusion was that public health risks related to the operation of the Oil Refinery will be mainly related to inhalation.

The commissioning of the Oil Refinery of the TANECO Complex will result in an increased load on the environment and in this connection the RT Cabinet of Ministers adopted a Decree No.569-r of 06.05.2006 to reduce emissions of pollutants from the Nizhnekamsk Industrial Zone by 20,000 t by 2010 (for more details see Table 2.3-3 Section 2.3.3). The Decree set individual quotas to the industrial zone enterprises for emission reduction in specific polluting agents (nitric dioxide, sulphuric dioxide, hydrogen sulphide, phenol, formaldehyde, ammonia and suspended agents). In order to implement the Decree, a Design of the United Sanitary Protection Zone of the Nizhnekamsk Industrial Zone Enterprises was developed by OAO “VNIPIneft” in 2008. OAO “TANECO” acted as an initiator of the design. A positive expert conclusion was received on the USPZ Design from the F.F. Erisman Federal Hygiene Research Centre on 20.05.2008; and a letter was prepared at the federal level by the Rospotrebnadzor on USPZ introduction (letter of 02.07.2008).

According to the expert conclusion on the USPZ Design, the preliminary assessment of the additional measures intended to reduce pollutant air emissions with regard to the carcinogenic and non-carcinogenic risks results in, an acceptable level of carcinogenic risk for the points near the village of Ishteryakovo, village of Klyatle and Klyuch Truda settlement (southern direction) in hexavalent chromium, its contribution making 53.4-54.1%. Increased indices of acute inhalation hazard impact on the respiratory organs near the village of Alan are attributed to the effect of nitric dioxide, sodium hydroxide, sulphuric dioxide and formaldehyde; the development process disease risks are affected by the presence of 1.3-butadiene in the air. The long-term inhalation impact hazard factors obtained indicate no issues with hazard factor (HQ) values; however, the hazard indices do not exclude the development of chronic respiratory organ diseases in all the reference points. In the highest-risk point the hazard indices for the respiratory organs are 50.9% and 78.49%.

For the residents of the communities situated inside the USPZ the probability of forming an additional carcinogenic disease level makes 0.69 case within an individual lifetime (Martysh settlement), ethylene oxide impact accounting for as much as 18%. The Martysh settlement residents face an increased probability of developing diseases of the respiratory system, the blood system and
cardiovascular system. The leading agents causing the risk are 1,3-butadiene and ethylene oxide. For the summary groups, the health risks are manifested in a probable development of diseases related to the central neural, cardiovascular, immune and reproduction systems, liver, kidneys, bone marrow and eyesight. Beyond the USPZ, acceptable carcinogenic disease development risk levels are recorded. Low-level risks have been identified in disease development related to respiratory organs and immune and reproduction systems (Alan and Prosti villages and Stroiteley township). The maximum hazard index values are observed in a neighbourhood of Nizhnekamsk town situated close to the industrial zone.

In other parameters (water impact, physical impact factors, etc.) the values of the measured and calculated environment impact factor levels correspond to the relevant permissible values (provided OAO “TANECO” facilities are commissioned) beyond the boundaries of the USPZ reviewed. Inside the USPZ boundaries the soil cover and air pollution levels exceed the values set for residential areas.

On the basis of the data obtained, the basic decisions on closest community impact reduction would be as follows:

1. Establish a united sanitary protection zone (USPZ) and it may require resettlement of the residents from two settlements located within its outlines before OAO “TANECO” is commissioned (Letter of 02.07.2008 by Rospotrebnadzor). At present, before all the issues related to a possible resettlement of the community residents are finalised, the RT Cabinet of Ministers has moved to suspend all procedures pertaining to citizen registration, land plot allotment, cadastre registration and land plot and real estate facility registration for the purpose of sales and performing other operations (a letter of 11.08.2008) in the affected area. It is presumed that the industrial enterprises in the area will combine to take a shared participation in the resettlement of the communities of Alan and Martysh, the share amounts being set as a result of assessing their aggregate negative impact on the environment (under the assessment OAO “TANECO” contribution accounts for 7%).

2. Issue enforcement notices (as annexes to the sanitary epidemiological statement relating to the USPZ) addressed to each of the enterprises in the industrial zone to carry out measures to reduce air emissions of harmful pollutants in accordance with the limits specified in the USPZ design. Such instructions were issued to OAO “TANECO” on 17.07.2008.

3. In line with paragraph 2.26 of SanPiN (SanR&S) 2.2.1/2.1.1.1200-03, the agricultural lands (accounting for 18.67% of the supply of land structure) should be restructured into agricultural holdings intended for cultivation of technical crops not used for alimentary product chain.

The possible resettlement issue is under consideration currently. As the USPZ was determined taking into account operation of all three Stages of the TANECO Complex (so the two settlements mentioned above are within the USPZ boundary) the issue on possible resettlement may be reconsidered based on the
current focus only on the Stage 1 facilities commissioning. The final decision on resettlement can be made based on the environmental monitoring results after the Stage 1 facilities commission.

It is proposed to consider the possibility of USPZ reduction and develop a program which includes:

- Development of air and noise monitoring program in these settlements and in the nearest vicinities
- Carrying out in-situ measurements according to the air monitoring programme (not less than 50 times per year for every pollutant in every point) and noise monitoring schedule;
- Conducting additional researches and assessment of the risk to the health of residents mentioned above
- Procedure of the SPZ changing according to the Russian legislation (main document is SanPiN 2.2.1/2.1.1.1200-03) in case of possibility of substantiation of the SPZ reduction.

Provided the results of the monitoring ensure that adverse impacts are within permissible levels the resettlement may not be required.

The corresponding item is included in the ESMP (par. 4.4 of table 8.1).

The social and economic consequences are reviewed in section 5.12.

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5.11 **IMPACTS ON THE PERSONNEL’S HEALTH AND SAFETY AND PREVENTIVE MEASURES**

**Organisational Structure**

The organisational structure includes Occupational & Industrial Safety Departments headed by Deputy Technical Director for Designs. The Technical Director reports directly to the Director General.

The project manager, FLUOR Company, has a sophisticated organisational structure, which exercises H&S control for the period of construction.

**Personnel Health Impact Sources & Influence Reduction Measures**

The major sources of possible personnel impacts are as follows:

1. Ineffective plant equipment and design solution arrangement, which may cause a high workpost injury rate
2. Explosive hazards in some premises
3. Equipment depressurisation at filling and draining operations
4. Harmful agent emissions by motor vehicles and at filling operations
5. Working area air pollution in production, auxiliary and social premises by harmful agents
6. Noise produced by furnace burners, torches, pumping equipment, compressors, air coolers, air blower and ventilation equipment in the buildings
7. Vibration generated by compressor equipment
8. Insufficient workpost illumination and
9. Insufficient sanitary, social and healthcare supplies to the workers

As far as the above issues are concerned, OAO “TANEKO” has provided for measures to mitigate and prevent harmful personnel impacts.

The Stage 1 facilities equipment layout took into account a possible approach to the equipment by mobile stock, underground communication laying and optimum ramp construction. The piping fixtures are situated in locations which are easily accessible for servicing and maintenance. Grounds and pass-through bridges are provided for on ramps and along routes for fixture servicing. The use of PPE is provided for during maintenance work.

The space planning solutions take into account the requirement for multi-purpose premises in one building. Some of the buildings scheduled for a permanent personnel presence are made explosion safe by using monolithic ferroconcrete (control panels, social buildings and controller units).

The production is fitted out with up-to-date high-efficiency equipment and automatic control system (TP ACS). The technological processes are automatically controlled from operator rooms. There are no outdoor workposts scheduled for a permanent personnel presence. All the processes related to raw material and product production, storage and pumping are performed in pressurised equipment. The draining and filling operations at the liquefied carbohydrate gas (LCG) rack is achieved by fitting out the filling rack with a gas equalising system using a nitrogen cushion. To reduce harmful agent emissions during motor vehicle filling, air tight filling parking lots and a vapour recovery systems are provided for. Warehouse cargo handling operation mechanisation provides for the use of electric loaders, mobile racks and electric trolleys with a platform and standard pallets.

The optimum air and microclimate parameters in the production, auxiliary and social premises will be maintained by climate control systems of heating and intake and exhaust ventilation. The operator and controller unit premises will be provided with a permanent intake system to an air supply pressure with at least a 5 time full air volume exchange. Air conditioning is designed for the operator, controller, chromatography and pyroxide storage premises. The equipment with the potential to result in harmful agent emission is to be fitted out with local exhaust ventilation devices.

In order to reduce noise at the time of furnace and steam machine commissioning, noise absorbers are to be used with steam blowing lines and high noise-level valves are to be insulated. The cogeneration plant is provided for noise absorber equipment fitting of spring-loaded safety valves and air vents; the piping will be equipped with noise insulation between safety valves and silencers, while a silencer is to be fitted on the smoke chimney. The compressor foundations are separated from the floor structure by bitumen-covered fibre material preventing the building structure from vibration transfer. All the pumping and compressor equipment plants are located in isolated rooms requiring no permanent-basis
personnel present. Entrance into the premises accommodating high noise-level equipment will only be authorised with personal hearing protective equipment. The workposts in the rooms with noisy equipment, where personnel presence is provided for, are located in sound-proof booths. For noise level reduction purposes the ventilation equipment will be mounted in isolated premises, noise absorption will be used in intake and exhaust systems, the ventilators are to be installed on vibration-proof foundations and the ventilators are to be connected to air ducts by flexible spacers.

Artificial lighting is provided for in the production premises. The production premise working area illumination parameters have been selected in line with the requirements of SNiP 23-05-95. The operator and controller rooms with no natural lighting are to be provided with health improving ultraviolet irradiation.

The sanitary, hygienic and social services are to be provided to the personnel in the social buildings with the capacities for 480 and 270 persons, which are being designed; the buildings are to accommodate properly equipped cloakrooms, shower cubicles, bathroom units, warm-up rooms and dirt and clean overalls storage units. For a round-the-clock personnel food catering the social buildings will include food finishing and dispensing canteens. The MRD and laboratory buildings provide for rest and meal rooms. The domestic and potable water supply will be provided from an internal site network. The domestic and potable water supply system is intended to meet the needs of the social premises, canteen and laboratory and laundry production needs. The water quality meets the sanitary and epidemiological requirements.

The healthcare services to the complex personnel will be provided at the OAO Nizhnekamskneftekhim out-patient clinic, while a healthcare room will be attached to the administrative building and the social buildings will accommodate first medical aid rooms. A laundry has been designed to handle overall washing

**Russian Law Requirements to H&S Applicable to OAO “TANECO” Personnel**

**Operation Personnel Requirements**


Main requirements to employees are as follows:

- proper education and
- lack of medical contra-indication set by the Russian Ministry of Health & Social Development.

Prior to their appointment to an unassisted workpost, the employees are to undergo the following:

- special training corresponding to their work profile
- workplace training
- occupational safety briefing and
check of occupational safety requirements knowledge.

The production personnel will be permitted to carry out unsupervised work at any operations involving a high hazard level (POT RO 14000-005-98 Regulation. High Hazard Level Operations. Organisational Details) only on condition a proper admittance order is executed to contain the organisational and technical measures ensuring save operation performance in specific conditions and provided the below conditions are met:

- at least 18 years old
- found fit for operation performance by medical examination
- at least one year work record in said operation
- certificate entitling to conduct such operations and
- workpost briefing on operation performance safety.

The occupational safety training (proper personnel training, certification, refresher training and knowledge testing) should be conducted in line with the state standards and branch regulatory standards:

- GOST 12.0.004-90 SSBT Occupational Safety Training Organisation. General Provisions;
- Occupational Safety Training & Occupational Safety Requirement knowledge Testing of Organisation Employees, approved by Decree No. 1/29 of 13.01.03 of the Russian Labour Ministry and Russian Education Ministry; and
- PB 09-540-03 General Explosion & Fire Safety Regulations for Chemical, Petrochemical & Oil Refining Production Units.

According to the Federal Law On Industrial safety of Hazardous production Facilities, the personnel operating any hazardous production facilities should undergo training and certification in the sphere of industrial safety under the requirements of RD 03-444-02 Regulation on Procedure of Training & Certifying Personnel of Organisation Active in Industrial Safety Sphere of Hazardous Production Facilities Controlled by Russian Gosgortekhnadzor.

Female labour is organised according to the requirements of SanPiN 2.2.0.555-96 Sanitary Regulations & Standards. Hygienic Requirements to Conditions of Female Labour. When falling pregnant, women are transferred to work which is not related to PC use, or PC operation time is limited for them (no more than 3 hours per shift), provided the hygienic requirements set by SanPiN 2.2.2/2.4.1340-03 are met.

**Workposts Organisation & Equipment**

The workposts for persons engaged in the technological processes are organised in compliance with the requirements of:

- SP 2.2.11312-03 Hygienic Requirements to Designing Newly Built & Reconstructed Industrial Enterprises,
- SP 2.2.2.1327-03 Hygienic Requirements to Technological Process Organisation, Production Equipment & Work Tools; and
Knowledge Testing

The knowledge of occupational safety requirements and practical safety skills acquired by the employees within the process of training are subject to testing and documental confirmation. The safe work knowledge and practical skill testing for blue collar employees is conducted by immediate operation managers, the relevant range corresponding to the knowledge of occupational safety and instruction requirements and, if needed, the knowledge range to extend to special occupational safety requirements (paragraph 3.1 of the Procedure). Under paragraph п.2.2.3 of the Procedure, the rules pertaining to knowledge testing of blue collar profession employees in a specific organisation shall be set by the employer.

The list of documents needed for occupational safety requirement knowledge testing:

- Regulation on Organisation & Conducting Occupational Safety Requirement Knowledge Testing in Respect of Blue Collar Profession Employees; and
- Register of Certificates Issued on Occupational Safety Requirement Knowledge Testing.

The knowledge testing in the organisation is carried out under schedules approved by the organisation manager.

All the personnel inclusive of managerial and engineering staff undergo a primary knowledge test. The post-hire testing is conducted within the terms set by the enterprise manager.

The knowledge of newly appointed managers, managerial employees and experts shall be tested within at least one month after appointment to their position.

The workers should undergo knowledge tests on an annual basis, while the managers and experts should do it at least once every three years. The employees involved in operations related to high occupational safety requirements shall undergo their periodic knowledge tests on an annual basis.

An extraordinary knowledge test shall be held irrespective of any previous test date:

- in case of technological process modification, new equipment and mechanism type introduction and introduction of new regulations and instructions in safety engineering and production hygiene;
- in case the employees violate their job descriptions and occupational safety regulations and instructions; and
- on orders by the supervisory authorities, in case insufficient knowledge of occupational safety instructions and job description is found among the employees.

An occupational safety room/corner shall be set up at the facility under design (Recommendations on Organising Work of Occupational Safety Room & Occupational Safety Organisation).
Safety Corner, Decree No. 7 of 17.01.2001 by the RF Ministry of Labour & Social Development).

Reduction of Harmful Impacts on Employees

Reduction of harmful impacts on the employees includes the following measures:

- mandatory medical examinations: preliminary ones before hiring and periodic ones with regard to specific operational features;
- special employee training in relation to the professional safety issues;
- employee provisions with collective and PPE (GOST 12.4.011-89 OSSS. Employee Protective Equipment. General Requirements & Classification).
  Correct and timely use of PPE; and
- permanent-basis purposeful sanitary education.

Personal Protective Equipment

On the basis of Art. 221 of the RF Labour Code and in accordance with the Model Standards of Free Issuing of Overalls, Protection Footwear & Other Personal Protective Equipment to the Employees Involved in Operations Featured by Harmful and/or Hazardous Labour Conditions & in Operations Conducted under Special Temperature Conditions or Related to Pollution in the Oil & Gas Complex Organisations, approved by Order No. 443 dated 06.07.2005 of the Russian Federation Ministry of Public Health & Social Development and the standards in place at the OAO “Nizhnekamsk Oil Refinery”, the personnel should be provided with protection clothes, protection footwear, as well as with gauntlets, rubber gloves, protection goggles and personal respiratory organ protective equipment.

The personal protective equipment (PPE) provided for under the model standards represent a mandatory minimum. The enterprise may take a decision (within the collective bargaining agreement) on issuing any PPE beyond the standards set.

The PPE is used within the protection and prevention measure set in the cases when other measures are unacceptable or fail to ensure safe labour conditions.

For protection of respiratory organs from the effect of carbohydrate gases and oil product vapour filtering gas masks are used (box brands A, B and BKF), which are applied for performance of urgent short-term operations, when the harmful agent air concentration is not high: generally, for sampling, during accidents, sudden gas emissions and for casualty evacuation.

Hose-type gas masks, models PSh-1 (TU 6-16-2053-76) or PSh-2 (TU 6-16-2054-76) are used in the cases, when there is a shortage of oxygen in the ambient air, generally, for maintenance work inside the plants, in tanks and wells. Operations involving the use of a hose-type gas mask must be obligatorily conducted with a stand-by worker.

A hard hat is used to protect the head against possible injuries.

For the protection against electrical shocks the personnel is provided with rubber dielectric gloves and dielectric mats. Lepestok (Petal) respirators are used for dust protection. Preventive straps and belts are provided for maintenance operations.
Company’s H&S Regulatory Documents

The Company has developed and approved the following documents:

- Collective Agreement (2008) developed for the purpose of enforcing compliance with the labour and social guarantees to the employees, creating favourable conditions for OAO “TANECO” operations directed at stable and efficient Company activities related to improving the employee living standards, as well as at ensuring a reciprocal responsibility of the parties for compliance with the labour legislation, other acts containing labour law standards, branch pay rate agreement and this Agreement

- Internal employee handbook (of 11.10.2006), regulating alongside the RF Labour Code and other local standard-setting acts the internal labour routine inside the company, employee hiring and dismissal procedures, major employee and employer commitments, working hours and working hour use, off-work time, measures of encouragement for professional success and responsibility for labour discipline violations, as well as other labour relation issues

- Labour protection management system directed at the creation of safe and high-efficiency labour conditions for the purpose of preserving human health and capacity for work in the labour process

- Occupational safety instructions in effect in OAO “TANECO” divisions, which include introductory briefing issues, safe performance of fire and gas hazard operations, PPE provision procedure, etc.

- List of professions and positions entitled to receive milk or other equivalent alimentary products for 2008 (drawn up on an annual basis) and

- Standards of free soap and towel issuing to the employees for one month in 2008 (developed on an annual basis)

5.12 **Socioeconomic Consequences of Construction and Operation of Stage 1**

The implementation of the project related to the construction of an Oil Refinery Facilities of Stage 1 will have a number of positive effects on the socio-economic conditions of the community and the town at large.

5.12.1 **Socioeconomic Consequences of the Oil Refinery for the City and the Region**

The construction of a world-class Oil Refinery the first one in terms of its technologies in Russia and the CIS, will foster a further strengthening of the
economic potential of the Republic of Tatarstan and the Russian Federation. The Project implementation will enable further innovation and the introduction of new technologies.

The following should be noted among the Project's positive impacts:

- After Stage 1 is commissioned, it would ensure the production of more environmentally friendly products (by excluding the high sulphur content oils of the Republic of Tatarstan from the Russian export blend) It will enable a significant reduction in negative environmental impacts both in the plant area and in the town at large and would increase the enterprise market competitiveness.

- Stage 1 of the Complex will be constructed on the territory of the existing Nizhnekamsk Industrial Zone using the existing engineering, technical and transport infrastructure, which will enable a reduction in financial expenditures and environmental and social impacts of the construction process.

5.12.2 Promote the Employment; Provision of Comfortable Housing for the Company’s Employees

The construction of the Oil Refinery will have a number of positive effects associated with creation of new jobs both during the construction and operation phases of the TANECO Stage 1 facilities.

At the peak construction period some 14,000 persons will be involved. It will promote employment of the Nizhnekamsk population and higher budget deductions by the construction organisations.

Currently, the construction of the Oil Refinery has started. A residential block with a housing area of 46,000 sq.m has been constructed in Nizhnekamsk for the temporary accommodation of construction workers and for future accommodation of the operating personnel; additional 160,000 sq.m of housing are planned to be built in relation with the Project.

5.12.3 Offer of Competitive Working Conditions and Upgrading of Skills of Operating Personnel

The Oil Refinery is in need of skilled personnel who are scheduled for hiring from specialist educational establishments, after staff training and practical training at similar existing complexes in Russia and abroad.

At present TANECO started receiving of application from persons willing to work at the enterprise. The persons hired for work include students with no working experience, but whose diplomas only have good and excellent examination marks. These are mainly students of the Nizhnekamsk Chemical Technology College.
Competitive enterprises attract skilled personnel and reduce emigration of local residents.

Basing on the data obtained on the population's average earnings and housing prices, a conclusion may be made that high housing costs represent an acute problems for the town residents. OAO “TANECO” is the town's only company, which is attempting a solution to its employees’ housing problems, for instance, by shared housing construction and assisting in housing purchase. This is an important and significant factor for the employees.

5.12.4 Social Aspects Associated with Environmental Performance of the Stage 1 Facilities

Commissioning of the modern high-tech industrial facilities with new approach to minimize environmental impacts can create an example for other industrial operations in the given region.

Following the demand of the municipal authorities to limit pollutant air emission, Stage 1 design includes proper engineering and technological solutions and implies the use of dust and gas cleaning devices to limit the air discharges to the maximum of 10,000 tonnes per year.

The design of the USPZ prepared upon an initiative of OAO “TANECO” provides for a range of measures aimed at reducing air emissions from many enterprises located in the Nizhnekamsk Industrial Zone. This will, in turn, facilitate improvement of the environmental and health situation in the entire region.

Over 1.5 million tree seedlings have been planted at the initiative of OAO “Tatneft” and OAO “TANECO” at the area of 384.51 ha included in the Nizhnekamsk sanitary protection zone during the preparatory operations. The planting was undertaken within the framework of an action entitled Green Nizhnekamsk Shield and is a compensatory measure of the Complex construction environmental programme. OAO “TANECO” plans to bring up the total green plantation area in the short-term perspective to 500 ha, according to the compensatory measure schedule.
6 OVERALL ENVIRONMENTAL AND SOCIAL IMPACTS OF STAGE 1

Within the framework of the ESIA the following positive effects and negative impacts should be mentioned, including indirect and cumulative impacts.

6.1 CONSTRUCTION PHASE OF STAGE 1 FACILITIES

During construction phase, all impacts will be of local character and limited predominantly to the outlines of the construction sites.

The Project will have the following positive effects during the construction phase:

- The compact layout of the construction site and minimum use of adjacent areas;
- Development of the transport networks (motor roads, railroad tracks, a network of mooring facilities at the Kama River);
- Increase in the total forested area in the vicinity of the Nizhnekamsk industrial zone;
- Employment of environmental, health and safety specialists during the construction period to conduct continuous monitoring and supervision over the Project implementation;
- Construction of a residential district in the city of Nizhnekamsk for accommodation of construction workers and in the future for TANECO operating personnel;
- Use of the utilities networks already existing in the Nizhnekamsk Industrial Zone;
- An increase in construction worker jobs;
- Attraction of operating specialists with specialized secondary education or higher education.

At the same time, the construction work will cause also certain negative impacts:

- Allocation of areas for construction of the Oil Refinery and infrastructure facilities, and related disturbance of part of the water bioresources in the Kama River in the course of the dock chamber construction, as well as associated hydrologic parameters;
- Local additional pressure on atmospheric air quality, noise level and quality of surface and underground waters (potential impact).

The proposed ESMP will facilitate the development of an adequate and efficient range of measures to minimize the adverse impacts of the Project.
After commissioning of the Oil Refinery the following positive environmental and social effects will be achieved on a regional scale:

- Development of the oil refining sector in the Republic of Tatarstan on the basis of available hydrocarbon resources;
- Production of quality fuel which will meet the most stringent quality standards, including EU norms;
- Reduction in the air pollution level on a regional scale due to the use of environmentally sound fuel, and as a consequence, lower level of sickness and death rates among the population;
- Development of a number of environmental protection measures with the objective to improve the overall environmental situation in Nizhnekamsk District, in particular a decree has been issued by the RT Cabinet of Ministers to decrease in the release of pollutants to the atmosphere by 20,000 t/year from the enterprises in the Nizhnekamsk Industrial Zone by 2010;
- Development and maintenance of the transport networks (motor roads, railroad lines, petroleum product pipelines);
- Competitive working conditions and improvement of skills and qualifications of the operating personnel;
- Improvement of the employment situation and development of the occupational education and training.

The following positive effects will be achieved on a local scale:

- Minimization of the length of the engineering infrastructure networks (access roads, railroad tracks, heating pipelines, power transmission lines and petroleum product pipelines) due to the optimal location of the Oil Refinery site, and as a consequence, reduced risk of potential emergency situations;
- Construction of the Company’s own wastewater treatment facilities for all types of wastewater generated at the Oil Refinery and implementation of water recycling systems;
- Permanent and periodic monitoring of specific environmental components in conformity with the Russian national and international requirements and analysis of the actual negative impacts;
- Technological adequacy to ensure that wastewater treatment meets the requirements for treated water to be released in fishery water bodies (in the Kama River);

*Air, surface water bodies, groundwater and underground water, flora, fauna and noise environment*
- Intention to construct the Company’s own landfill for hazardous industrial waste disposal in conformity with the best available practice.

The following impacts during operation of the Oil Refinery will require adequate monitoring and implementation of the planned measures aimed at their minimization or compensation for the inflicted damage:

- An increase in the total number of air emission sources, although the ambient air quality at the boundary of the established USPZ will comply with the Russian and recommended international norms, including those of the World Health Organization;

- Increased risk of emergency situations with environmental and social consequences;

- Intensification of traffic in the Nizhnekamsk District;

- Increased risk for the TANECO employees’ health and the public health in the nearest residential areas.

In addition, potential resettlement of Alan and Martysh villages may be required following confirmation of the level of negative impact on these communities after commissioning of the Oil Refinery. This issue is addressed in the ESMP.

Provided that the proposed measures and environmental and social monitoring are carried out in due manner, the negative environmental, health and social impacts will be within the permissible limits.

In general, the Project will have an overall positive effect with respect to the sustainable development of the whole region.

Under the condition of implementation of the proposed measures within the framework of the ESMP, the Project will comply with the standards and guidelines of the Equator Principles, the OECD recommendation and IFC/WB standards.
7 MONITORING AND SUPERVISION DURING CONSTRUCTION AND OPERATION OF THE OIL REFINERY

7.1 ORGANIZATION OF ENVIRONMENTAL MONITORING

7.1.1 Targets and Objectives of Environmental Monitoring and Supervision

OAO “TANECO” proposes to conduct continuous monitoring, including environmental monitoring to meet the following objectives:

- obtain automatic information about the environmental situation at the TANECO facilities and within the area of their impact and provide such information in due time to the supervisors of the respective facilities and the Company’s management;
- monitor compliance with the legislative and regulatory environmental requirements; and
- ensure implementation of measures aimed at environmental protection and sustainable use and restoration of natural resources.

According to the above objectives the monitoring and supervision system of OAO “TANECO” will include the following elements:

- Collection of primary data, creation and maintenance of a database relating to air emission and wastewater discharge sources, condition and pollution of environment media within the zone impacted by the TANECO facilities;
- Assessment of the environmental status and risk for public health in the process of the Company’s operations based on the primary data collected;
- Analysis of the current environmental situation and prediction of its changes in the process of the operation of the Company’s facilities;
- Provision of reliable and timely information for the Company’s officials and supervisors of facilities for the purpose of planning and for urgent managerial decisions relating to environmental performance;
- Preparation and keeping of report documentation relating to routine environmental monitoring (primary records: record books, test reports, laboratory analyses, etc.), including submission of data for the Company’s environmental service required to fill in the compulsory statistical reports and computation of charges to be paid for negative environmental impacts and use of natural resources;
- Preparation of official statistical reports in conformity with the established formats;
- Collection of data relating to implementation of environmental protection measures and their efficiency;
• Relations with the relevant environmental supervisory agencies;
• Exchange of environmental information with other interested parties, including municipal and regional environmental monitoring systems within the framework of existing agreements and data exchange protocols;
• Demonstration of environmental responsibility of the Company with respect to compliance with the Russian and international requirements to environment protection and public health.

7.1.2 Environmental Monitoring and Supervision System during Construction of Stage 1 Facilities

During the construction phase of Stage 1, the main responsibility for environmental monitoring will stay with relevant construction contractors. The construction contractors and subcontractors should:

• Ensure annual checking of engines of vehicles and machinery to verify their compliance with the national environmental norms for exhaust gas quality;
• Make sure that any natural construction materials are delivered only from licensed quarries;
• Organize monitoring of areas designated for short-term onsite waste storage in conformity with the design requirements and ensure timely removal of waste for recycling and/or authorized disposal.

OAO “TANECO” will organize periodic checking of compliance of its contractors and subcontractors performing work at the construction site with the applicable environmental requirements

Baseline monitoring
Baseline monitoring should include, in addition to the data collected earlier, implementation of a baseline survey program for investigation of:

• Atmospheric air;
• Natural groundwater;
• Natural surface waters.

Baseline monitoring of atmospheric air
In connection with the fact that main potential impact of the TANECO operations on the atmospheric air quality within the residential areas will be imposed on the settlements of Klyatle, Alan, Martysh and Ishteryakovo it is required to conduct further baseline investigations in those settlements. The location of monitoring points is shown in Figure 7.1-2. A detailed monitoring program is presented in Appendix 3.

Baseline monitoring of groundwater
Groundwater investigations will foresee determination of main indicators, including heavy metals, COD, BOD and the pH values along the perimeter of the
industrial site of the planned TANECO Complex in all directions: north, north-west, north-east, south, south-west and south-east. Such an approach will permit to assess of the groundwater quality entering and leaving the industrial site.

The areas for location of monitoring wells are shown in Figure 7.1-1.

Groundwater should be sampled from the uppermost groundwater horizon. According to the regulatory documents groundwater sampling should be carried out for the entire thickness of the aquifer, i.e. the monitoring wells should be drilled down to the impermeable rocks.

The groundwater monitoring program is presented in Appendix 3.

Baseline monitoring of surface waters

To determine the level of pollution of natural surface waters within the zone potentially affected by the Oil Refinery before the commissioning of the production facilities, as well as to conduct monitoring during the construction phase and assess the contribution of the new facilities to environment pollution during the operation phase, it is proposed to conduct monitoring of the surface water quality at two points located outside of the industrial site:

- Point 1 – to the south-east of the site at the Tungucha River within the settlement of Martysh;
- Point 2 – to the south-west of the site, in a nameless creek at its outlet from the Complex site.

Sampling frequency should be at least once every three months.

In addition, TANECO will conclude the agreements with the Roshydromet Agency that it would provide to TANECO the data referring to the water quality in the Kama River and in minor watercourses in Nizhnekamsk district at the respective cross-sections at points, where Roshydromet conducts environmental monitoring.

Availability of a complete set of data will permit the Company to make reliable forecasts of changes in the environmental situation which will enable it to correct the assessment of the Company’s contribution to the environmental pollution. Depending on the data obtained, it will be decided whether it would be required to carry out periodic monitoring during the construction phase.

Based on the proposals described above a monitoring schedule of the background conditions during the construction phase has been developed and approved for the construction phase of Stage 1.

7.1.3 Operational Environmental Monitoring and Supervision after Commissioning of Stage 1 Facilities

The following types of monitoring of the sources of environmental impacts will be carried out at the TANECO facilities in order to compare the obtained data with the established norms, criteria or baseline parameters and assess their compliance:

- Periodic monitoring in the course of normal operation of the facilities;
Additional monitoring in case of emergency situations. Monitoring will be carried out in industrial areas, in the part of the united sanitary protection zones and the landfill for industrial waste disposal, as well as at other infrastructure facilities in the Nizhnekamsk Industrial Zone. Monitoring will be conducted in conformity with relevant RF legal requirements and regulatory documents and guidelines of federal, regional and municipal levels and international requirements directly applicable to the TANECO operations.

According to the legislative requirements and recommendations contained in the IFC Standards, OAO “TANECO” will monitor during the operation phase:

1. Emissions of pollutants to the atmosphere;
2. Physical impact factors;
3. Industrial and storm water runoff;
4. Surface waters;
5. Groundwater and underground waters;
6. Areas for waste storage and disposal;
7. Flora and fauna.

In the process of operation of its facilities OAO “TANECO” will organize monitoring as follows:

1. Monitoring of air emissions, including:
   - Automatic monitoring at 8 air emission sources accounting in total for 80% of all pollutants released to the atmosphere;
   - Periodic monitoring (at least 4 times per day at a stationary station and up to 50 measurements of 8 pollutants per year with the aid of a mobile laboratory) at the boundary of the USPZ of the Nizhnekamsk Industrial Zone, near the villages of Klyatle, Alan, Martysh and Ishteryakovo with subsequent assessment of the safety level of emissions for the local communities.

Besides the listed above settlements there are several settlements located outside of the USPZ which supposedly could be under the influence of the industrial zone. These settlements are as follows: Nikoshnovka (to the south-east of the industrial zone), Prosti (to the north), Stroiteley (to the west) and the city of Nizhnekamsk (to the north-west). In case there is a registered excess of air quality norms in the nearest vicinity of the USPZ (with respect to pollutants emitted by the TANECO Oil Refinery), it is suggested to measure the air quality on a regular basis in these settlements as well.

2. Monitoring of physical impact factors (noise level):
   - Quarterly measurements of the maximum and equivalent noise levels at a stationary monitoring station at the USPZ boundary near the village of Klyatle;
   - Individual measurements of the maximum and equivalent noise levels at the USPZ boundary near the villages of Ishteryakovo, Martysh and Alan.
3. Monitoring of industrial and storm water runoff to determine 24 pollution indicators, including heavy metals, COD, BOD and pH values at certain time intervals:
   - At outlets of the industrial and storm water runoff drainage to the sewer networks;
   - At outlets of treated wastewater to collector ponds;
   - At outlet of treated wastewater from System II to the Kama River.

4. Monitoring of surface water quality to determine 31 indicators, including heavy metals, COD, BOD and pH value in main water regime phases at two monitoring points characterizing the zones of potential impact of the TANECO Complex.

   The two compulsory points for surface water monitoring are:
   Point 1: south-east of the industrial site (Alanka River at the settlement of Martysh);
   Point 2: south-west of the industrial site; storm water runoff, the quality of which is dependent among other things on the runoff from the TANECO site.

5. Monitoring of groundwater and underground waters to determine 38 indicators, including heavy metals, COD, BOD, pH values and petroleum hydrocarbons; once or twice per year depending on identified necessity. In case of accidents or when an increase in the pollution level is recorded, it might be necessary to conduct additional observations.

6. Monitoring of pollution in the vicinity of areas used for short-term onsite waste storage and at the landfill for industrial waste disposal by analyzing the composition of soils (including radiological monitoring) and leachate, determining the physicochemical and bacteriological composition of surface, ground and underground waters using monitoring wells, the content of pollutants in atmospheric air and technical parameters at certain time intervals (at least once every ten days up to once per quarter of a year depending on the parameters to be determined);

7. Flora and fauna monitoring to determine their quantitative and qualitative composition in the vicinity of the Complex site, including the creeks and rivers. It will include multiseasonal visual observations and controlled catches of fish at least once every 3 years.

The summary of the monitoring program is presented in Appendix 3 (Table 2). Additional researches should be conducted on air quality and noise level in the Alan and Martysh settlements and in their vicinities. Based on these researches, the possible need for the resettlement of the residents from these settlements will be reassessed.

All monitoring results will be collated and stored in an integrated database. Based on the present proposals a operational environmental monitoring program (EMP) was developed and approved in the supervisory agencies of the Republic of Tatarstan and the city of Nizhnekamsk.
In order to implement the monitoring program, a stationary monitoring point for ambient air quality monitoring will be set up near the village of Klyatie. For construction of such a monitoring station it is required to select an equipment supplier, determine the set of equipment and obtain required approvals and permits from the relevant supervisory agencies.

A corresponding item has been included in the Environmental and Social Management Plan for construction of Stage 1 (see Table 8.1 par. 1.1).

Continuous environmental monitoring Program envisaged by OAO “TANECO” will meet the objectives of the monitoring listed above.
According to the EP and IFC Performance Standards 1 and 5, the Company is currently developing a procedure for monitoring the social environment and will make the data obtained available to the interested parties. It is required to document the monitoring results, define required corrective and preventive measures and include them into the management program subject to regular updating.

It is essential to implement such corrective and preventive actions and ensure subsequent monitoring and recording of their efficiency.

OAO “TANECO” has to develop and implement a social environment monitoring program related to the following affected parties:

1. Local residents living within the preliminary USPZ or to be resettled (if applicable);
2. Local residents living within a range of 5 km from the united sanitary protection zone;
3. The Company’s employees.

The following parameters are to be monitored with respect to the local residents living within the preliminary USPZ or to be resettled:

- Quality of new housing;
- Possibility of employment for resettled people;
- Changes in the employment level;
- Impact on public health in the new housing environment;
- Changes in the standard of living (salaries and wages).

Monitoring should be conducted in the following ways:

- Polling of resettled residents with the aid of questionnaires at least once per year (more frequently during the first year);
- Arrangement with medical institutions to provide quarterly information about the number of visits by local residents with complaints caused by cardiovascular, breathing and gastro-intestinal diseases;
- Comparison of the information obtained with the average statistical data for the given administrative area;
- Preparation of quarterly reports on the results obtained. If the actual data exceed the average statistical values, identify the cause of the problem.

A report on a current situation based on the monitoring data is to be submitted to the municipal administration and disclosed to the local community.

The social monitoring of the community within a range of 5 km from the USPZ should cover the following aspects:

- Impact on public health (measurements of quality of ambient air and groundwater);
• Changes in the standards of living (for most of residents involved in TANECO operations, the level of their wages);
• Quality of produce of the private farms (concentrations of harmful pollutants in soil).

In order to carry out monitoring, the following measures should be taken:
• Hold meetings with residents and record all incoming complaints about deterioration of the environment (if any);
• Agree upon with the medical institutions located in the area selected for resettled residents that they should provide quarterly information about the number of visits by local residents with complaints caused by cardiovascular, breathing and gastro-intestinal diseases;
• Carry out laboratory investigation to monitor the quality of ambient air, groundwater and soils and compare the obtained data with the regulatory norms;
• Compare the data obtained with the average statistical data for the given administrative area;
• Prepare quarterly reports on the results obtained. If the actual data exceed the average statistical values, identify the cause of the problem.

A report on monitoring results is to be submitted to the administration of a settlement and the residents should be informed about the results.

The following parameters should be recorded in the process of social monitoring of the Company’s employees:
• Average monthly wages;
• Working conditions at workplaces;
• Use of personal and collective protection equipment by employees.

The following measures are required to carry out social monitoring:
• Approve a routine monitoring program, including monitoring of OHS compliance as its integral part;
• Comparison of the wages of the Company’s employees with the average monthly wages in the region.

A report about the current situation should be submitted to the Company’s management, to the Company’s employees, personnel management department and the OHS management department. More detailed information is available in the Section 5.11.

Moreover, TANECO will perform public consultation according to the PCDP taking into account requirements of the Equator Principles, IFC standards and OECD recommendations.
According to the specific IFIs’ requirements the borrower should develop an action plan / an environmental management plan, carry out corrective measures and elaborate monitoring procedures to monitor the progress of the project implementation according to the IFIs’ requirements.

An environmental and social management plan (ESMP) for implementation of the Oil Refinery Project was developed to ensure efficient management of environmental and social aspects of the Project in compliance with the requirements of Russian and RT legislation, best international standards and the Equator Principles.

The measures specified in the Environmental and Social Management Plan (ESMP) were elaborated taking into account the relevant requirements of the Russian legislation, the Equator Principles, the OECD Recommendation, the IFC Performance Standards and EHS Guidelines of the World Bank Group/IFC.

The environmental and social management plan is presented in Table 8.1. Monitoring and supervision of the implementation of the plan will be performed by TANECO personnel within the framework of routine inspections and checks. In addition, it is possible to organize independent monitoring of the ESMP implementation by independent experts at intervals to be agreed upon with potential lenders.

The expenditures for implementation of the required measures can be finally determined and adjusted by the Beneficiary in accordance with the current conditions.
<table>
<thead>
<tr>
<th>No.</th>
<th>Main issues required actions</th>
<th>Preventive and corrective actions</th>
<th>Prospective results in compliance with advanced / future requirements of national and international legislation</th>
<th>Priority of implementation: Construction (C)/ operation (O)</th>
<th>Responsible divisions</th>
<th>Timeframe</th>
<th>Estimated cost, Rubles</th>
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<tbody>
<tr>
<td>1</td>
<td>Management of the Project Environmental Aspects</td>
<td>1. Compliance with the requirements to air quality</td>
<td>1.1 Set up of a stationary monitoring station for air quality monitoring before the Stage 1 facilities (Oil refinery) commissioning</td>
<td>Contract an equipment supplier, determine composition supply and obtain appropriate agreements and permits from corresponding authorities</td>
<td>Implementation of the programme for air monitoring, compliance with the IFC EHS guidelines (monitoring recommendation)</td>
<td>C</td>
<td>Environmental department of OAO TANECO jointly with Fluor</td>
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<tr>
<td>1.2</td>
<td>Confirmation of air quality requirements at the closest residential area situated at TANECO area impacted during construction phase</td>
<td>Conduct background monitoring of atmospheric air within the area impacted by the TANECO facilities in the villages of Klyatle, Alan, Martysh and Ishteryakovo</td>
<td>Data obtaining and its review for further compliance with regulatory and IFC requirements. Compliance with RF Law “On protection of atmospheric air”,</td>
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<td>compliance with IFC EHS Guidelines (monitoring recommendation)</td>
<td>monitoring for construction phase</td>
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</tbody>
</table>
| 1.3 | Monitoring of design parameters of air emissions and confirmation of compliance with regulatory and IFC requirements to air quality at the closest residential area situated at TANECO area impacted during Stage 1 facilities operation | • Conduct automatic monitoring of 8 sources of air emissions generated 80% of prioritized substances emissions,  
• Conduct periodic monitoring in the vicinity of the United Sanitary Protection Zone (USPZ) boundary near the villages: Alan, Klyatle, Martysh and Ishteryakovo with following review of the Complex impact,  
• In case air quality norms are not met at the USPZ boundary (in respect to pollutants emitted by the TANECO Oil Refinery), it is suggested to measure the | Data obtaining and its review for further compliance with regulatory requirements. Compliance with RF Law “On protection of atmospheric air”, compliance with IFC EHS Guidelines (monitoring recommendation) | Environmental department of OAO TANECO | Periodically during the whole operational phase according to the approved environmental monitoring programme of OAO TANECO | To be evaluated by OAO TANECO |
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<tr>
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<td>air quality on a regular basis in the following settlements: Nikoshnovka, Prosti, Stroiteley and the city of Nizhnekamsk</td>
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<td>2</td>
<td>Minimisation of water consumption and surface and groundwater pollution prevention</td>
<td></td>
<td>2.1 Detailed organizational and technical measures for high-salt-containing waste water utilisation (generated during industrial waste water treatment) are required</td>
<td>Best acceptable choice of high-salt-containing waste water utilisation (organizational and technical measures)</td>
<td>Contractor for design of reception of the effluents for the pressure maintenance system (GUP INHP) jointly with Environmental department of OAO TANECO</td>
<td>October - December, 2008</td>
<td>Administrative charge</td>
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</table>

2.1.1 Determine a location of the point for reception of the effluents for the pressure maintenance system of NGDU “PrikamNeft”;
2.1.2 Select a route for transportation of this type of effluents to the reception point;
2.1.3 Carry out detailed engineering design development for the pipeline including selection of material and appropriate design solutions, and
2.1.4 Obtain the required permits and approvals for

Compliance with RF Land Code

Administrative charge

To be evaluated by OAO TANECO

Expenses according to the fixed charge of
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<th>Timeframe</th>
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| 2.2 | The expected concentrations of benzene exceeds the IFC recommended value | • Specify the concentrations of pollutants in the wastewater to be released to the Kama River,  
• Consider an option to reduce the benzene content (based on the analyses) in treated wastewater to take into account the IFC recommendations. | Compliance with IFC recommendation to waste water for Oil Refinery | O | Environmental department of OAO TANECO | 2011-2012. | Included in expenses for operational monitoring of waste water |
| 2.3 | Ensure compliance with the predetermined technological parameters of the planned wastewater treatment facilities and facilitate their construction taking into account implementation of recirculation system | • Complete selection of suppliers of specific technological equipment for all planned treatment units and sections;  
• Perform detailed engineering design development for the entire scope of the treatment | Choice of the best acceptable wastewater treatment system and ensure technological parameters specified in the project | C | Contractor for design of wastewater treatment system jointly with Environmental department of OAO TANECO (GUP INHP RB) | October – November, 2008  
December, 2008 – June, 2009 | To be evaluated by OAO TANECO |
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<td>documentation, Compliance with IFC recommendation</td>
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<td>3.</td>
<td>Waste management</td>
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<td>3.1</td>
<td>Due to the fact that the detailed engineering design development has not been completed, the exact amount of waste generated during the operation phase has not been determined (at the stage of the Feasibility Study many operating / technological parameters were assessed using the data of similar existing facilities).</td>
<td>1. Clarify the list of generated wastes, their physicochemical characteristics and hazard class (on the basis of detailed engineering design development and specification of the list of equipment to be used). 2. After commissioning of Stage 1 develop and have approved according to the prescribed procedure a document specifying the waste generation norms and permitted waste disposal limits (WGWDL).</td>
<td>Compliance with the Russian legislative requirements</td>
<td>O</td>
<td>OAO TANEKO, EPC contractors</td>
<td>1. Clarification of the list – Before the commissioning of the Oil Refinery. 2. Development and approval of the WGWDL – After commissioning of Stage 1 facilities.</td>
<td>Administrative charge</td>
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<td>3.2</td>
<td>The project design does not specify the exact location,</td>
<td>Ensure supervision over contractor organizations in</td>
<td>Compliance with the Russian</td>
<td>C</td>
<td>OAO TANEKO</td>
<td>During the entire construction</td>
<td>Administrative charge</td>
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Oil Refinery
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<th>No.</th>
<th>Main issues required actions</th>
<th>Preventive and corrective actions</th>
<th>Prospective results of compliance with advanced / future requirements of national and international legislation</th>
<th>Priority of implementation: Construction (C)/ operation (O)</th>
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<th>Timeframe</th>
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<tr>
<td>3.3</td>
<td>The project design materials do not provide documented confirmation of a possibility for return of spent catalysts and absorbing agents to equipment suppliers for regeneration.</td>
<td>1. Obtain from equipment suppliers a confirmation that they will receive this type of waste for regeneration. 2. In order to ensure reception of this waste for regeneration in amounts indicated in the design materials it is required to foresee in supply agreements for catalysts and absorbing agents a possibility and a procedure for supply of spent catalysts and absorbing agents for regeneration.</td>
<td>Implementation of adopted design solutions: compliance with the quantities of waste estimated in the design to be sent for regeneration.</td>
<td>O</td>
<td>OAO TANECO</td>
<td>Before the commissioning of Stage 1</td>
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<td>3.4</td>
<td>The design materials do not contain technical specifications of a waste incinerator. It is necessary to specify the relevant data relating to waste generation as a result of the incinerator operation.</td>
<td>Determine the technical characteristics of the waste incinerator, including the amount of waste to be incinerated and characteristics of waste generated by the incinerator.</td>
<td>Implementation of adopted design solutions: compliance with the quantities of waste estimated in the design for incineration, as well as the quantities of waste generated in the process of incineration.</td>
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<td>OAO TANECO</td>
<td>Before the commissioning of Stage 1</td>
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<td>3.5</td>
<td>The amounts and types of waste to be disposed of in municipal landfills are subject to approval by the territorial division of Rospotrebnadzor.</td>
<td>Have the amounts and types of waste to be disposed of in municipal landfills approval by the territorial division of Rospotrebnadzor.</td>
<td>Compliance with the Russian legislative requirements</td>
<td>O</td>
<td>OAO TANECO</td>
<td>Before the commissioning of Stage 1</td>
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<td>3.6</td>
<td>The project design does not foresee any possibility for temporary storage / processing / disposal of</td>
<td>Clarify a possibility for: - Disposal of industrial waste in existing landfills for industrial waste within the</td>
<td>Compliance with the Russian legislative requirements</td>
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<td>Before the commissioning of Stage 1</td>
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<td>industrial waste generated in the process of operation of Stage I facilities. This issue is caused by a delay with the detailed engineering design development and subsequent construction of a landfill for industrial waste disposal.</td>
<td>Lower Kama industrial region; - Disposal of industrial waste in other existing landfills for industrial waste. - Temporary accumulation and storage of industrial waste on the Company’s sites (provided that adequate safety precautions are taken).</td>
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<td>3.7</td>
<td>It is necessary to complete detailed engineering design development for a landfill for industrial waste disposal.</td>
<td>1. Clarify the data relating to the density of waste planned for disposal in the industrial waste landfill (in order to be able to determine the required effective volume); 2. Develop an engineering design of an industrial waste landfill for the entire service life of the planned Complex; The engineering design should provide for: - Use of advanced synthetic materials for the top and</td>
<td>Compliance with the Russian legislative requirements / Compliance with the best international practices</td>
<td>O</td>
<td>OAO TANECO and contractor for detail design of the landfill</td>
<td>Before the commissioning of Stage 1</td>
<td>To be evaluated by OAO TANECO</td>
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<td>- Installation of a secondary impermeable synthetic layer for the bottom liner in order to ensure double protection;</td>
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<td>- Measures to prevent mechanical damage of impermeable liners (especially during their installation);</td>
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<td>- Separate disposal of wastes of different hazard classes;</td>
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<td>- A system for monitoring soil and groundwater contamination, as well as other environment media.</td>
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<td>3.8</td>
<td>The proportion of waste to be disposed of in the industrial waste landfill is approximately 68% of the total waste generation amount. A reduction in</td>
<td>1. Prepare a list of measures to be taken to decrease the waste volume sent for disposal in the industrial waste landfill. This list should include the</td>
<td>Prolongation of the landfill service life. Compliance with the best international practices</td>
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<td>Before the commissioning of Stage 1</td>
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<td>3.9</td>
<td>The design materials do not specify the exact location, dimensions and equipment of areas to be used for waste accumulation and short-term onsite storage.</td>
<td>1. Specify the list of waste types and amounts to be stored on a temporary basis on site, as well as expected duration of storage; 2. Specify the location of areas for short-term waste storage; 3. Determine the dimensions of areas and required conditions for short-term waste storage in accordance with waste</td>
<td>Compliance with the RF Law “On Industrial and Consumption Waste”</td>
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<td>OAO TANECO</td>
<td>Before the commissioning of Stage 1</td>
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that proportion would prolong the landfill service life.

following:
- Decontamination (to ensure lower class of hazard);
- Compaction (volume reduction);
- Direct use as secondary resource;
- Processing of some waste as secondary resources.

2. Conduct an inventory and investigate possibilities of the regional waste recycling and disposal infrastructure.
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<td>3.10</td>
<td>No procedures and systems for waste handling reporting at production sites have been elaborated.</td>
<td>Develop and have approved a Waste Management Plan. The format of the Plan is given in Appendix 2.</td>
<td>Compliance with the Russian legislative requirements / Compliance with the best international practices</td>
<td>O</td>
<td>OAO TANECO</td>
<td>Before the commissioning of Stage 1</td>
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II Management of the Project Social Aspects

4. Public consultation and information disclosure

4.1 Permanent-basis information provision to the local public and third interested parties on the environmental and social aspects of the Company activities at the ESIA stage has not been arranged to the full scale

Develop and integrate a Public Consultation and Disclosure Plan. Major measures at the ESIA stage should be as follows:
• Drawing up a complete list of stakeholders;
• Familiarisation with the ESIA materials and auxiliary materials by stakeholders in
Compliance with the Russian legislative requirements / Compliance with the best international practices | C | OAO TANECO, ERM | Till April, 2009 | Administrative charge |
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<th>No.</th>
<th>Main issues required actions</th>
<th>Preventive and corrective actions</th>
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<td>4.2</td>
<td>Procedures of stakeholders consultation and information disclosure at</td>
<td>Adherence to the Public Consultation and Disclosure Plan. Development and Compliance with the Russian legislative</td>
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<td>OAO TANECO</td>
<td>Till construction and during construction</td>
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<td>the Stage 1 construction stage have not been developed</td>
<td>integration of the social oriented Programme of stakeholders interaction at the construction stage. The major measures at the consultation and information disclosure at the construction stage should be as follows: •Informing stakeholders on the project implementation progress and its impact on social and natural environment; •Informing the project management and contractors on pending problems, which may affect the project implementation; •Conducting efficiency monitoring of the measures oriented at negative effect prevention/abatement.</td>
<td>requirements / Compliance with the best international practices</td>
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<td>construction preparation work and performance, transporting cargoes for the construction needs, etc.; •Identifying and properly training the personnel responsible for this kind of activities; •Conducting proper training for the subcontractor entity personnel.</td>
<td>legislative requirements / Compliance with the best international practices</td>
<td>construction phase of Stage 1</td>
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<td>4.3</td>
<td>Procedures of stakeholders consultation and information disclosure at the Stage 1 operation stage are not fulfilled to a proper extent</td>
<td>Prepare and approve the Public Consultation and Disclosure Plan. When implementing the Plan, the major measures in relation with information disclosure and interested parties informing at the Complex operation stage should be as follows: •Forming and maintaining constructive relations with the local residents, agricultural</td>
<td>Compliance with the Russian legislative requirements / Compliance with the best international practices</td>
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<td>• Development of air and noise</td>
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Oil Refinery

OAO “TANECO”
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<tr>
<th>No.</th>
<th>Main issues required actions</th>
<th>Preventive and corrective actions</th>
<th>Prospective results of compliance with advanced / future requirements of national and international legislation</th>
<th>Priority of implementation: Construction (C)/ operation (O)</th>
<th>Responsible divisions</th>
<th>Timeframe</th>
<th>Estimated cost, Rubles</th>
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<td>nearest vicinities • Carrying out in-situ measurements according to the air monitoring programme (not less than 50 times per year for every pollutant in every point) and noise monitoring schedule; • Conducting additional researches and assessment of the risk to the health of residents mentioned above • Procedure of the SPZ changing according to the Russian legislation (main document is SanPiN 2.2.1/2.1.1.1200-03) in case of possibility of substantiation of the SPZ reduction</td>
<td>region</td>
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5. **Grievance mechanism**

5.1 Creation of a centralised grievance mechanism at • Development and approval of a grievance and claim reception • Compliance with the Russian C OAO TANECO Till commissioning Administrative charge
<table>
<thead>
<tr>
<th>No.</th>
<th>Main issues required actions</th>
<th>Preventive and corrective actions</th>
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<th>Responsible divisions</th>
<th>Timeframe</th>
<th>Estimated cost, Rubles</th>
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</table>
|     | the ESIA stage              | Procedure from the interested parties affected by the project implementation;  
• Appointing a person in charge for Procedure implementation;  
• Making a register of the grievances;  
• Keeping a complaint and proposal log;  
• Issuing an Order on the maximum deadline period for the company departments to give responses to any grievances and to send the responses to stakeholders | legislative requirements / Compliance with the best international practices |                                  |                  | of the Stage 1 |                      |
| 5.2 | Creation of a centralised grievance mechanism at Stage 1 | Continue with the measures prescribed in paragraph 5.1. Besides:  
• Keep a register to record any grievances from the contractor entities;  
• Receiving all the document | Compliance with the Russian legislative requirements / Compliance with the best international practices | C                                  | OAO TANECO     | During construction phase of Stage 1 | Administrative charge |
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<th>No.</th>
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<td>originals from the contractor organisations and keeping them for 5 years</td>
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<td>Providing information to, and entering into agreements with, the contractor entities on keeping record of any grievances to include the provisions, under which the contractor entities shall: • Keep a grievance register; • Submit its copies with notes on measures taken, persons in charge and respond copies to the Deputy Chief of the Corporate Identity &amp; Public Relations Department at least within two weeks since any such grievances are filed; • Keep the document originals at the contractor entities till the construction completion phase; • Transfer all the documentation</td>
<td>Compliance with the Russian legislative requirements / Compliance with the best international practices</td>
<td>C</td>
<td>OAO TANECO</td>
<td>During construction phase of Stage 1</td>
<td>Administrative charge</td>
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<td>dealing with the issue to the OAO TANECO administration for archiving and keeping for five years.</td>
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<td>5.3</td>
<td>No centralised grievance mechanism in place at Stage 1</td>
<td>Continue with the measures specified in paragraph 5.1.</td>
<td>Compliance with the Russian legislative requirements / Compliance with the best international practices</td>
<td>O</td>
<td>OAO TANECO</td>
<td>During construction phase of Stage 1</td>
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<td>III</td>
<td>General Management</td>
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<td>6.</td>
<td>Conducting operational environmental monitoring and social monitoring</td>
<td>Implement the Programme of the environmental monitoring and social monitoring based on recommendations in the present ESIA (section 7) and developed monitoring plans</td>
<td>Compliance with Russian regulatory requirements and international recommendation (monitoring)</td>
<td>C, O</td>
<td>Environmental Department of OAO TANECO, Public relations and corporate image department</td>
<td>During the whole period of the Company existence</td>
<td>To be evaluated by OAO TANECO</td>
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<td>7.</td>
<td>Awareness and professional development</td>
<td>Conduct training sessions on international requirements and</td>
<td>Compliance with international</td>
<td>C</td>
<td>ERM</td>
<td>November, 2008</td>
<td>Training expenses according to the</td>
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<td>8.</td>
<td>Continuing improvement of environmental management during the Project implementation</td>
<td>Implement environmental management system based on ISO 14001 standard and ensure its continuing improvement</td>
<td>Implementation of the best available practices and opportunity of further EMS certification</td>
<td>C, O</td>
<td>Environmental Department of OAO TANECO</td>
<td>During construction and operational phase of Stage 1</td>
<td>Contract for the Provision of Consulting Services</td>
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<td>9.</td>
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<td>Implement OAO “TANECO” Environmental action plan for 2007-2009</td>
<td>According to the Plan</td>
<td>According to the Plan</td>
<td>According to the Plan</td>
<td>According to the Plan</td>
<td>Training expenses, administrative charge OAO TANECO</td>
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<td>10.</td>
<td>Improvement of the TANECO standards and procedures for contractors’ activity management</td>
<td>Adjust and implement standards for contractors’ activity management, including observance of requirements in the field of occupational health, industrial safety and environmental protection at stages of: • Preparation of tender</td>
<td>Compliance with international requirements, implementation of the best available practices</td>
<td>C, O</td>
<td>Environmental Department of OAO TANECO, FLUOR</td>
<td>During construction and operational phase of Stage 1</td>
<td>Administrative charge</td>
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<td>• Conclusion of contractor's agreements,</td>
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<td>• Operational supervision and monitoring at construction sites, including the scope and regularity of inspections, meetings, formats and periodicity of reporting, and non-compliance management mechanisms.</td>
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APPENDICES