Preparation of regional pre-investment studies in the Western sector of the Russian Arctic
Stage 5 of consulting services
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Construction of Wastewater Treatment Plant in settlement of Severomorsk-3, Murmansk Region

Final Report

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BRIEF SUMMARY OF THE PROJECT

This project resolves the problem of sewage treatment in the Severomorsk-3 settlement, which is discharged to the river Srednyaya without being treated, hence making the environmental and sanitary and epidemiological situation tense.

The project is going to be implemented by MUP "Severomorskvodokanal". MUP "Severomorskvodokanal" provides water supply and water discharge of Severomorsk, settlements of Roslyakovo, Roslyakovo – 1, Safonovo, Safonovo-1, Kortik, Schuk Lake, Severomorsk-3.

The project cost is RUR 280M.

During the initial contact with initiators, the following donors expressed interest in this project: EBRD, IFC, NEFCO and NDEP.

The project implementation will result in:

- A decrease in the content of pollutants in the WWTP effuent on average 4 times related to suspended substances, 4 times related to BOD, 7 times related to oil products, 7 times related to nitrites, 2.5 times related to phosphates;
- An improvement of the sanitary state of the water body, quality of water in the river itself and in the system of lakes through which it flows, and in the Kola Bay;
- An improvement of the conditions for the reproduction of fisherie resources in these water bodies

As for social consequences, the realization of the project will

- Increase the environmental safety of the population residing near the river;
- Provide working places for a part of the population of Severomorsk ZATO (altogether 32 working places are planned).

The analysis shows that the proposed project is financially not feasible. This is mainly caused by the revenues being smaller than the Operation & Maintenance costs. A further tariff increase or a decrease in O&M costs is therefore necessary to have a financially feasible project. However, as the economic benefits are likely to be large, the economic feasibility should also be calculated in order to estimate the overall feasibility of the project. Hence, a grant financing percentage might be needed in addition to debt financing.

Special econimic benefits include:

a) Cuts in expenditures of industrial enterprises and community services for water treatment and maintenance of water treatment facilities;
b) Decrease of water organisms contamination by untreated sewage from industrial and community activities:
    - Improvement of the habitat of water life organisms;
    - Increase of the general health care level (as a result, cuts in expenditures for health care);
c) Infrastructure development.

This IEP can be replicated within the region considering the fact that the sewage water treatment problem is one of the most critical for Murmansk Region.

List of abbreviations

BOD	Biochemical Oxygen Demand
EBRD	European Bank of Reconstruction and Development
EVD	The Agency for International Business and Cooperation: a branch of the Ministry of Economic Affairs of the Netherlands
GOUP	State Regional Unitary Enterprise
IFC	International Finance Corporation
IRR	Internal Rate of Return
LLC	Limited liability company
MPC	Maximum permissible concentration
MUE	Municipal Unitary Enterprise
NDEP	Northern Dimension Environmental Partnership
NEFCO	Nordic Environment Finance Corporation
NPV	Net Present Value
O&M	Operation and Maintenance
OEC	Organization for Economic Cooperation
PPP	Public Private Partnership
SanPin	Sanitary Regulations and Standards
SNIP	Construction Norms and Regulations
FTIP	Federal Targeted Investment Program
SRLI	Safe Reference Levels of Impact
WWTP	Wastewater treatment plant
ZATO	Closed Administrative-Territorial Entity

1 GENERAL PROVISIONS

1.1 Background

Main sources of the Arctic water contamination are the following:
• sea and river craft vessels;
• continental wastewater;
• shelf mining operations;
• long-range contamination transport by sea flows;
• atmospheric contamination transport;
• burial of radioactive waste and nuclear reactors.

Especially strong and various anthropogenic impact experience environmental systems of White, Barents and Kara Seas.

Natural conditions of Arctic Ocean water exert considerable influence upon spread and accumulation of contaminants. Climatic and hydrological peculiarities (width, flow speed and direction, temperature, salinity, water stratification, streamflow and total water balance) contribute to essential dilution of streamflow and intensive precipitation of contaminants, remaining in sea ecosystems for a long time.

Barents Sea – is the biggest shelf water body of our country. Open part of Barents Sea is characterized as “clean”. At the same time in the areas of active navigation the sea is stably contaminated with oil slick (5-7 MPC). High levels of contamination have the bays: Kola, Teriberskiy and Motovskiy Bays (concentration of phenol and petroleum derivatives 6-12 MPC). Total wastewater spillover amounts about 150 million m^3. Soils actively accumulate contaminants (concentration of phenol – up to 5 ng/g, oil products – up to 3,5 mg/g, pesticides – up to 5 mg/g, PHB -40-60 mkg/g).

In ZATO Severomorsk objects of social sphere and others through the settlement and city sewerage systems into the water bodies annually is discharged more than 10 million m^3 of crude wastewater. This results in pollution of the rivers Srednyaya, Gryaznaya and Kola Bay. Because of water bodies’ contamination with crude wastewater their efficiency decreases considerably. Natural nutritive base is changing and dying, quantity of spawning grounds and commercial fish inhabiting these water bodies is going down.

The biggest anthropogenic load in the basin of Barents Sea bears Kola Bay, where about 40 enterprises of Murmansk and Kola cities and settlements located at its shore are dumping household sewage and crude wastewater.

The objective of this project is reduction of anthropogenic load on the water bodies, improvement of environment and rehabilitation of aquatic water resources and increase of the safety level of population life in Murmansk region.

Sewage treatment plant refers to nature-conservative facilities. WWTP construction is carried out to provide sanitary, hygienic and antiepidemic protection of people and environment protection from contaminations, thrown along with wastewater into the sewage system.

This project resolves the problem of sewage treatment in the Severomorsk-3 settlement, which are so far discharged to the river Srednyaya without being treated, hence making the environmental and sanitary and epidemiological situation tense. Due to the housing development and capital repair of old housing stock in Severomorsk-3 settlement the level of redevelopment has increased. In such conditions the only construction of sewage treatment facilities in Severomorsk-3 settlement will generally provide normal operation of disposal facilities and accordingly improve the environmental and sanitary and epidemiological situation.

Due to the fact that the founder of MUE “Severomorskvodokanal” is the Committee for the Municipal Property Management of Severomorsk full administrative support of the IEP from local government bodies is expected.

1.2 Possibility to reproduce IEP

Considerable contribution into pollution of regional water bodies with crude wastewater is done by enterprises of housing and communal services: State Regional Unitary Enterprise (GOUP) «Murmanskvodokanal», GOUP «Apatityvodokanal», GOUP «Kandalakshavodokanal», GOUP «Monchegorskvodokanal», GOUP «Olenegorskvodokanal», MUE «Severomorskvodokanal», LLC «Teplovodosnabzheniye» of Polyarnye Zori town, LLC «Teplovodokanal» of Kovdora town, Federal State Unitary Enterprise «Vodokanal» MO of Polyarniy town.

Thus, this IEP can be replicated within the region considering the fact that the sewage water treatment problem is one of the most critical for Murmansk Region.

1.3 Participants and flow chart of IEP implementation

The project is planned to be realized by MUE «Severomorskvodokanal».
The Design is performed by NP Ekos Company (НП «Компания «Экос»)

Figure 1-1 Project parties organization chart

Financial assets from investor come to special-purpose account of enterprise run on a paying basis MUE «Severomorskvodokanal», acting as the customer of the realized projects. Administration of ZATO Severomorsk on the basis of existing license and tripartite agreement between an enterprise, administration and investor will act as a developer and provide necessary building control up to the key ready commissioning of the object.

2 CHARACTERISTIC OF INITIATOR FACILITY AND ITS FINANCIAL STATUS

2.1 Details and brief characteristic of initiator facility

MUP “Severomorskvodokanal” provides the water supply and water discharge of Severomorsk, settlements of Roslyakovo, Roslyakovo – 1, Safonovo, Safonovo-1, Kortik, Schuk Lake, Severomorsk-3.

The enterprise is located at address: Gadjieva 1a, Severomorsk, Murmansk Region, Russia
The enterprise consists of pump station service sites, water supply and sewage systems. There are 13 outlets for wastewater discharge, among which 11 discharge to the Kola Gulf, 1 outlet discharges into the Gryaznaya River through mechanical treatment plants, and 1 outlet discharges to the Srednyaya River. A design of biological treatment plants for wastewater discharge into the Srednyaya River have been developed.

Annual water consumption is 21000 thousand m3, water discharge is 9400 thousand m3. The length of water supply and sewage pipelines has increased to 162 km of water pipelines and 73 km of sewage pipelines.

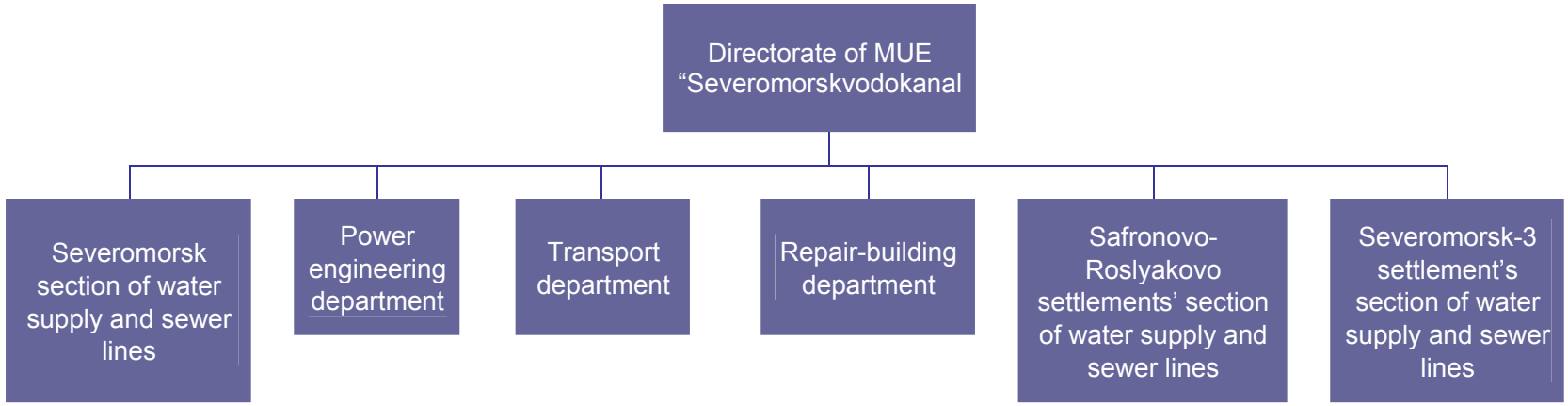
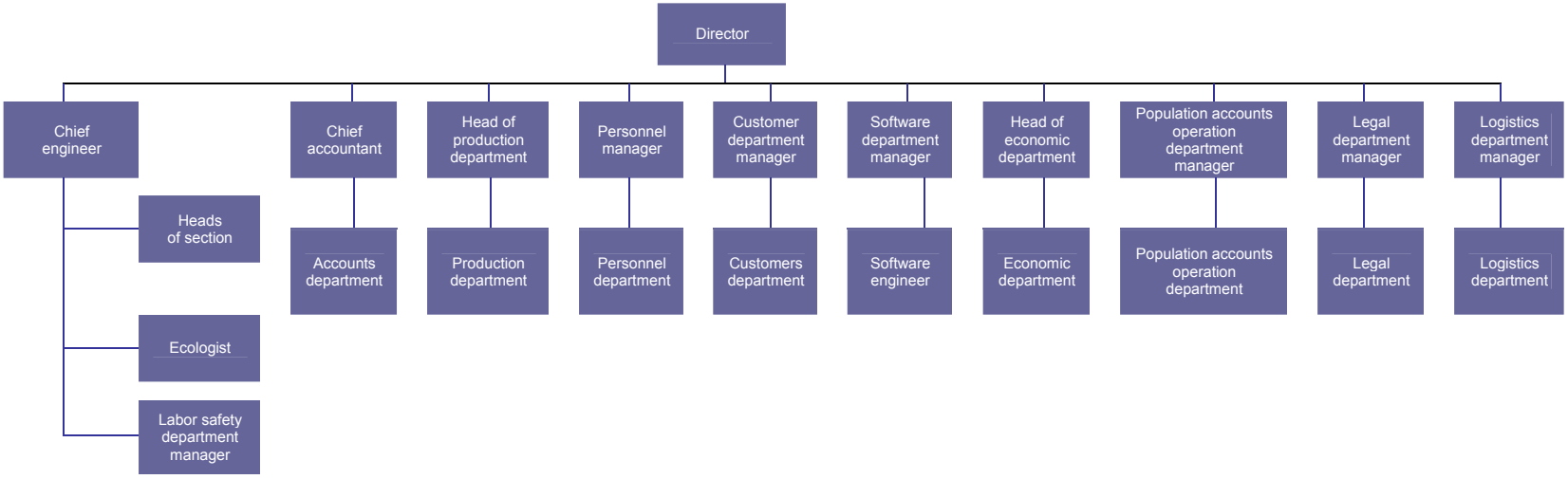


Figure 1-2 Organization chart of MUE "Severomorskvodokanal"



MUP “Severomorskvodokanal” has been present on the market of engineering and communal services since 1956, gained practical experience of operational and maintenance of water supply and sewage networks, servicing and repair of trucks and tractors, buildings and objects, implementation of innovated techniques. The company has implemented techniques for pipeline building with flexible foam insulation, pumping unit frequency control of rotation to enable energy saving, extend lifetime of the equipment and steady pressure increase in the water supply system.

The company includes the following departments: Energy Department (to maintain all electrical equipment of the company), Repair and Construction Department (to perform capital and preventive repairs of building and objects of the company), on-line Services (which all day around stay on-duty to monitor water supply parameters and correct emergency situations in different parts of the supply chain)

Today «Severomorksvodokanal» is involved in specific solutions in engineering and communal services market, actions implementation relating to communal services reconstruction and improvement.

2.2 Legal status of facility

MUE Severomorskvodokanal has a municipal pattern of ownership. Legal address: 184600, Gadzhieva Str., 1-a, the city of Severomorsk.

The enterprise is registered on the territory of the Russian Federation by state registration number 2035100101090 as of June 27, 2003.

Extract from Primary State Registration Number register as of 22.04.2008 No. 71157 contains data concerning MUE «Severomorskvodokanal» with Primary State registration Number 1025100711570.

MUE «Severomorskvodokanal» was tax registered since 03.11.1998 with Identification Taxpayer’s Number ИНН 5110120910. Number and address of Tax Inspectorate – Interdistrict Inspectorate of Ministry of taxes and Duties of Russia No. 2 in Murmansk Region No. 5110, Sgibneva Str., 13a, the city of Severomorsk.

Incorporator of Municipal Unitary Enterprise «Severomorskvodokanal» is municipal enterprise ZATO Severomorsk (184600, Lomonosova Str., 4, the city of Severomorsk, Murmansk Region, phone (8-815-37) 5-07-60).

In the name of municipal enterprise property rights of municipal unitary enterprise are exercised by the Head of municipal unitary enterprise ZATO Severomorsk, City deputy council, ZATO Severomorsk administration and Property Management Committee of ZATO Severomorsk in the limits of their competence, stated in the orders «About municipal enterprises of ZATO Severomorsk» and articles of association of the company.

The enterprise is a legal entity, has civil rights according to the object and aim of its activity, and bears responsibility connected with this activity.

Quotation of articles of association concerning credentials of general director – director of the enterprise is a sole executive body of the enterprise, acts in the name of the enterprise without power of attorney, including representation of its interests, executes deals in established order and in the name of enterprise, approves structure and staff of the enterprise. Director of enterprise organizes implementation of the decisions of the enterprise property owner.

2.3 Current state of production and sales of products, prospects of facility development

2.3.1 Current status

Severomorsk-3 settlement is one of the territorial subdivisions of ZATO Severomorsk and is situated along the river Srednyaya (Shuchya). ZATO Severomorsk is 35 kilometers east of the regional center Murmansk to which it is connected by the interstate road.

Figure 2-1: Position of Severomorsk-3 settlement in the Murmansk region.

ZATO Severomorsk is located along the Kola Bay, which has a mountainous landscape.

The building system of Severomorsk-3 settlement is characterized by 3-storey and 5-storey blocks of flats built in the 60-ies of the last century.
The Eastern part of the residential buildings is located along the river Srednyaya, which flows into the Kola Bay.

In the centre of settlement there is a 2-3-storey sociocultural and administrative building,. The boiler houses of the town and settlement run on the imported mazut.
Treatment facilities have not been designed for the settlement before.

The existing water disposal system of Severomorsk-3 settlement consists of:
- sewage system of the settlement;
- sewage pumping station;
- discharge header.

The sewerage system was constructed in the early 60-ies of the last century during the modernization of USSR Navy, which required development of the settlement's infrastructure with regard to the construction of housing and sociocultural objects.

The existing sewerage system of Severomorsk-3 settlement allows only collection and transportation of sewage to the discharge point in the river Srednyaya.

The current condition of sewage systems and MSPS (main sewage pumping station) can be characterised as satisfactory. Thus, the sewage flow diagram of the settlement is the following: sewage is collected by the sewage system of the settlement and enters into MSPS (main sewage pumping station) by gravity. From the MSPS, the sewage is pumped through the pipeline to the discharge point of the river Srednyaya at 100 kilometers north of the settlement's residential buildings. As noted above, this situation impairs sanitary and epidemiological condition of the river and settlement.

2.3.2 Characteristic of current production

The MUE "Severomorskvodokanal" produces 21000 thousand m^3 water and discharges 9400 thousand m^3 untreated sewerage annually.
Inputs of power and material resources are as follow:

а) electric power – more than 9 mln. kW for the sum of 17,5 mln. rubles;
б) other material assets – 4,3 mln. rubles.

Enterprise personnel amount to 286 people, out of which 63 with higher education, which make 22% of all employees. Fluctuation of personnel accounts 10% and mainly can be explained by the fact that people leave to the new places of living in accordance with the program of resettlement from the North.

2.3.3 Marketing and sales system of the manufactured products

Water supply to consumers and implementation of water disposal is done on the basis of agreements between enterprise and customers.

2.3.4 Characteristic of the environmental monitoring system (service) of facility

The Industrial laboratory of the MUE «Severomorskvodokanal» is accredited for technical competence and independence by Federal agency for technical regulation and metrology and is registered in the Unified registry of organizations, accredited by the Federal agency for technical regulation and metrology by the No. POCC RU. 0001.515897. Certificate of analytical laboratory accreditation registered on July 29, 2009. Term of validity – up to July 29, 2014.

In accordance with requirements of Sanitary rules СП 1.1.1058-01, approved by Chief sanitary doctor of the Russian Federation as of July 10, 2001 the enterprise has worked out a program (plan) of industrial control of water quality for the period of 2007 – 2011, approved by the first deputy head of municipal body ZATO Severomorsk and conformed with Territorial department of Russian Consumer Surveillance authority (Rospotrebnadzor) in Murmansk Region in ZATO Severomorsk.

In accordance with the said program industrial laboratory of MUE «Severomorskvodokanal» is conducting the following tests of water quality analysis:
- as per microbiological, organoleptic, generalized, inorganic factors – from water bodies;
- as per microbiological, organoleptic, generalized, inorganic, organic and radiological factors – before entering water supply network;
- as per microbiological, organoleptic, generalized, inorganic factors – from supply net.
- per microbiological, organoleptic, generalized, inorganic, organic and radiological factors – before entering water network;

In the flood period an intensified verification control mode as per chemical and bacteriological factors is introduced,
The Centre of laboratory analysis and technical measurements in Murmansk Region approved the Program of industrial environmental monitoring of sources of contamination of water bodies of MNUE «Severomorskvodokanal» till 01.01.2009. Test results are provided to the Centre of laboratory analysis and technical measurements in Murmansk Region, to the Department of water resources of Dvina-Pechora basin water directorate in Murmansk Region.

1. In control outlets of discharged wastewater:
- water quality control analysis is done in the river Srednyaya three times during spring-autumn period in control outlets – 50 m upstream and 250 m downstream the discharge outlet;
- water quality control analysis is done in the river Gryaznaya three times during spring-autumn period in control outlets – 50 m upstream and 250 m downstream the discharge outlet;
- water quality control analysis is done in Kola Bay 1 time per quarter in the control outlet in the radius of 250 m from the discharge outlet.

2. Monthly analysis of the discharged wastewater is done. Results of analysis are provided to the Centre of laboratory analysis and technical measurements in Murmansk

Region, to the Department of water resources of Dvina-Pechora basin water directorate in Murmansk Region.

It is planned to sign an agreement with GO Murmanskoe GMS for carrying out of morphometric scanning of water bodies in the water intake area.

On the monthly basis a report of POD-13 form is provided to the Centre of laboratory analysis and technical measurements in Murmansk Region, to the Department of water resources of Dvina-Pechora basin water directorate in Murmansk Region;

Once a year, a report of 2-tp form (water industry) is provided to the Department of water resources of Dvina-Pechora basin water directorate in Murmansk Region.

2.3.5 Investment program and prospects of facility development

The enterprise developed investment program for the years 2010-2017 on restoration and development of water supply and disposal systems of ZATO Severomorsk, assuming financial investment of enterprise, municipality, regional and federal budgets. Perspective development of the enterprise depends on construction of new objects of social and industrial structure, increase in water supply and disposal.
This investment program was submitted to Severomorsk administration for review but by the moment of our research it was not approved due to the lack of budget for program's action items.

2.4 Characteristic of financial state of facility

This information can be obtained from the NPA Arctic Project Office or from the Executing Agency.

3 DESCRIPTION OF INVESTMENT ENVIRONMENTAL PROJECT

3.1 Description of IEP

An objective of the proposed environmental investment project is the construction of sewage treatment plant in Severomorsk-3 settlement. Construction site is 35 kilometers east of Murmansk in the Severomorsk-3 ZATO settlement of the town of Severomorsk, 250 meters north of the 5-storey block of flats No. 14 in Apakidze Street along the left bank of the river Srednyaya within the area approved by planning permission.

Figure 3-1 Sewage Treatment Plant (WWTP) layout in Severomorsk-3 settlement

The project shall meet the following requirements:

- proved for biological treatment of sewage waters with extraction of biogenic elements;
- WWTP shall be compact with attractive appearance and without excessive air pollution;
- WWTP shall be unsophisticated, reliable in operation and durable;

The following elements have been used from among the innovative solutions for WWTP design:

1. two stage bioreactor with the loading of «brush» type for microflora immobilization;
2. brush final filters made in form of shipping section, plant-manufactured;
3. anthracite high capacity filters of advanced treatment, made in form of shipping section, plant-manufactured;

4. assembly of the basic block of biological treatment in the following composition: denitrifier-aeration tank, sedimentation tank, two stage bioreactor made in the way that allows to perform assembly supply, thus minimizing the mounting works on site;
5. use of corrosion resistance materials for the equipment production
6. automated control system

Key parameters of the project “Sewage treatment plant of domestic sewage water of the settlement of Severomorsk-3 with the productive capacity of 1500m3/day” are presented below:

Technical and economic features of facility

Plant capacity	0,547 million m^3/ year
- in volumes terms	1500 m^3/ day
Gross site area	0,9879 ha
Architectural volume	16960,48 m3
Build-up area	3239,00 m2
Land-to-building ratio	0,2
Supplies expenditure per power unit:	
- electric energy	0,17 kW/h
- chemicals	0,006 tons
- heat amount	0,007 Gcal
Total number of employees	32
Annual output for the employee	
- in volumes terms	17109 thousand m^3/person-year

3.2 Justification of selected technology and its description

3.2.1 Processes that make the basis of IEP

The sewage treatment plant process flow diagram is shown in the figure below:

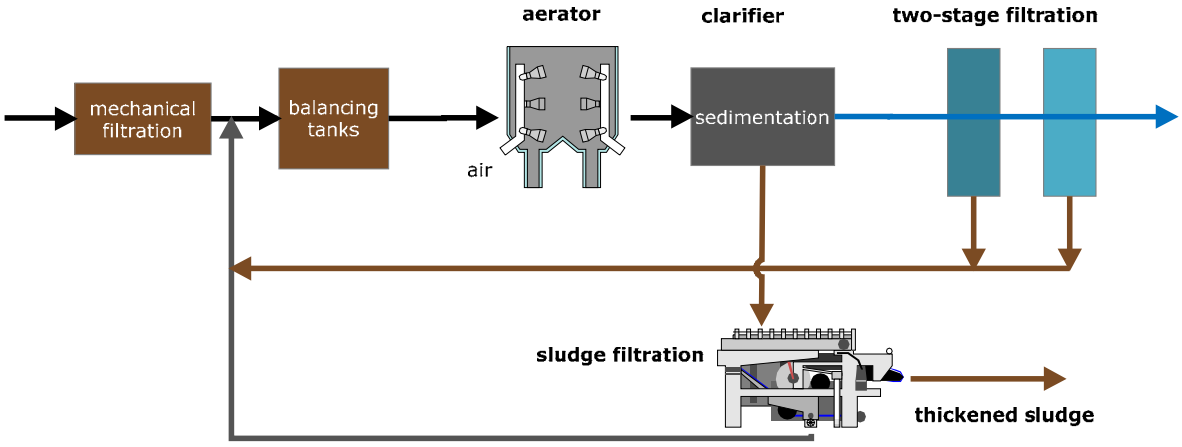


Figure 3-2 Proposed WWTP process flow diagram in Severomorsk-3 settlement.

In the proposed process flow diagram the sewage is pumped from the sewage pumping station in Severomorsk-3 settlement to the sewage treatment site, namely to the distribution chamber located before the mechanical treatment facilities. In the distribution chamber, the sewage is divided into two parallel flows. From the distribution chamber the sewage enters by

gravity the mechanical pre-treatment which consists of screw screen and screw sand catcher. In this equipment the sewage fluid is purified from the coarse waste, which do not require further dewatering. Coarse waste from the screens is transferred by the screw conveyor to a special container, which is carried by the automatic loader to the storage area. Twice a day containers are taken out by the special HMU transport to the SDW (solid domestic waste) landfill. In order to provide sanitary conditions at the site, the containers' content is desinfected with bleach powder. In the same way the sand is extracted from the sand trap into the container which has an opening in the bottom part, and then by the automatic loader the container is removed in suspension to the sand area. From there it is taken out by the transport of MUE Severomorskvodokanal (МУП «Североморскводоканал») for further utilization.

After the pre-treatment, the sewage fluid enters by gravity into the consumption balance tank containing of two sections operating in parallel. The feeding of the regulated consumption from each section of the balance tank is performed by submersible pumping units using two pressure pipelines to two parallel operating units of process tanks containing of the following reservoirs:
- denitrifier;
- complete-mix activated sludge system (aeration tank);
- vertical flow sedimentation tank;
- two stage bioreactor with "brush loading".

Hence, after balance tank the sewage is pumped into the denitrifier of each stage of treatment. The Denitrifier operate in a "mixer" mode, to which the return sludge is pumped from the clarifier by submersible pumps (external recirculation loop) and aeration tank (internal recirculation loop). The Denitrifier volume is mixed by ABS submersible mixers.

Then the sludge enters into the aeration tank.

Sludge mixing and aeration in the aeration tank is carried out using polymeric aerators. This type of aerator refers to fine-bubble aeration system. Air is supplied to the aeration system of the aeration tank by centrifugal blowers. The diagram described above provides for operation of facilities in nitri-denitrification mode with pre-denitrification area.

In the beginning of nitrifier (aeration tank) the cassettes with "brush loading" on a solid basis are installed.

Surplus sludge is removed from the secondary clarifier (99.3 – 99.4 % of moisture) using submersible pumps of the external recirculation loop, which are installed in the sludge "pockets" of the clarifier. Surplus sludge is forcedly pumped to the screw dewaterer, where the further sludge dewatering occurs using a flocculant. Dewatered sludge enters into a container, which is taken out by automatic loader to the dewatered sludge storage area.

From secondary clarifiers the settled sewage enters into two stage bio reactor with immobilized microflora, each stage of which operates in parallel. As an attached biocenosis carrier, in the same way as in aeration tank the "brush" loading is used. Each stage of bio reactor is separated by foraminated partition to two stages operating in sequential order, each of which has frames with "brush" loading installed. Bio reactor operates in a "mixer" mode.

Using of two stage bio reactor with immobilized microflora after the secondary clarifier creates the conditions in which the sludge carried from the secondary clarifier participates in biological processes of treatment, which allows carrying out nitrification at this stage. Before the two-

stage bio reactor the aluminium polyoxychloride solution prepared immediately at the injection point of the unit, is injected to the settled sewage. The phosphate group is accordingly removed from the settled sewage which allows reducing phosphorus concentration in treated sewage to MPC (maximum permissible concentration).

After the two-stage bio-reactor, the sewage flows by gravity into 4 brush filters, where treated sewage is filtered through the brush loading layer in upflow direction.

After the brush filters, the cleaned sewage enters into the filtration and disinfection facilities. The filters contain a system of 4 high-rate downward flow “purolator” filters with drainage, made of several layers of gravel of different size, and tubular water collecting system. After the filtration the sewage enters into the treated sewage reservoir, partitioned to 2 sections. Water from one sector enters into UV desinfection, and water from another sector is used for backwashing of the purolator filter. Disinfected sewage disposed by gravity to the river Srednyaya.

Water for filter backwashing the filters is supplied by submersible pumping units installed in the treated sewage reservoir. Flushing sludge waters of purolator filters are disposed by gravity to the flushing (sludge) waters reservoir. From there sludge water is pumped to the distribution chamber by submersible pumping units.

Change in contamination concentration in sewage by treatment stages in illustrated in table 3-1.

Table 3-1 Change in contamination concentration in sewage by treatment stages

Para Nos	Index names	Source water	After mechanical treatment facilities	After biological treatment facilities	After two stage bio reactor	After brush filter	After purolator filter	MPC
1	Suspended substances, mg/l	260	234	15,0	8,0	5	3	3
2	biological oxygen demand $_{n}$, mg/l	300	285	15,0	8,0	5	4	4
3	Ammonia nitrogen, mg/l	32	32	1,0	0,7	0,3	0,3	0,39
4	Nitrite nitrogen, mg/l	-	-	0,02	0,02	0,01	0,01	0,02
5	Nitrate nitrogen, mg/l	-	-	9,1	8,1	8,1	8,1	9,1
6	Phosphates P_2O_5, mg/l	13,2	11,88	4,75	4,75	0,46	0,46	0,5
7	Phosphate (P), mg/l	5,28	4,75	1,9	1,9	0,2	0,27	0,2

3.2.2 Characteristic and demand in raw materials and resources involved in production, specific consumption of raw materials and resources

Planned raw material consumption at WWTP operation in Severomorsk-3 settlement is illustrated above.

Table 3-2 Planned raw material consumption

Plant expenses	Quantity
Coagulant Aqua-Aurat 30, kg/year	5,645.35
Oxalic acid, kg/year	48.60
Electric power (without optic fiber), kW/year	1,013,924.74
Flocullant "PRAESTOL", kg/year	1,533.00

3.2.3 Level of energy intensity of production

Electric power:

Electric power consumers of WWTP are the following facilities:

– process capacity building with built-in administration and on-site facilities (PCB and AOF);
– balance tank;
– on-site sewage pumping station (SPS);
– garage;
– warehouse;
– lodge;
– exterior electric lighting (EL).

Electric power consumers of WWTP facilities are as follows:

– process equipment:
  a) pumps;
  b) air blower;
  c) mixers;
  d) ultraviolet lamps;
  e) automatic control system;
– support equipment:
  a) ventilation units;
  b) electric heaters;
  c) electric lighting.

2 transformer package substation of type 2КТПН400-6/0,4-ХЛ (2KTPN400-6/0,4-HL) of 100% operational compatibility produced by Samara plant “Elektroshit” («Электрощит»). 2 transformers ТМГ-400/6/0,4 (TMG-400/6/0,4) are installed at the substation.

Power is supplied by two 6kW cable lines from two individual sources. Substation 6kW busbars are sectionalized. 6kW load-break switch provides routine switching from the main line to the spare one without SPT load shedding. 0.4kW Busbars are also sectionized and fitted with section switch.
In normal mode the power lets in by both feedlines. If voltage fail on one of the inlet, the power will be fully transferred to remained line. If any transformer fails to function, the load will be put on another one. In this case the sections of 0.4kW busbars will be combined.

Substation from side of 6kW line is protected from lightning overvoltage by lightning protectors. Automatic machines are used as protective switching devices of outgoing lines. On the side of 0.4kW line a meter for power consumption accounting is installed.

3.3 Characteristic of the area, resources and infrastructure used for investment project implementation

3.3.1 Layout of the area of IEP implementation

The site for treatment facilities is situated to the north of the settlement Severomorsk-3 on the riverside of the Srednyaya river. The site has been freed of constructions, engineering services and vegetation. The site relief is not even, there are low-mark sections.

Location of buildings and constructions on the site is done in accordance with stipulated technological processes. The fence around the site shall be done of meshy sections stretched between metallic pillars and contain hinged gates at the entrance constructed on the northern side of the road.

At the site there is a parking place for the staff. Around the main building there shall be a circular passage, at the exit from the site – a place where SDW (polycarbonate) containers shall be installed.

Table 3-3 Technical and economical indexes of the site

Index description	Measurement Unit	Amount
1. Total site square (fenced territory)	Ha	0.9879
Including:		
Building site	Ha	0.2010
Coverage site (including perimeter walks)	Ha	0.4002
Amenity planting square	Ha	0.3867
2. Amenity planting percentage	%	39

3.3.2 Buildings

Technological building and the administrative building are equipped with the following systems:

- Fire main for service and drinking water;
- Hot water main;
- Sanitary sewer system.

Main indexes on the water main and sewage system are listed in Table 3-4.

Table 3-4 Main indexes on the water main and sewage system

System name	Required pressure at lead-in, m	Estimated discharge				Notes
		m^3/day	m^3/h	h.p.	In case of fire, h.p.	

Fire main for service and drinking water	In case of fire 30.0 14.0	32 5.0	10.27 1.27	3.66 1.16	2.5 -	Discharge for inner fire extinguishing 1 jet of 2.5 h.p.
Including hot water supply	14.0	2.50	0.95	0.87	-	
Sanitary sewer system	-	5.0	1.27	2.76	-	

3.3.3 Utility and drinking water supply and filre line

Cold water supply of the building is provided through a system of joint fire main for service and drinking water that leads cold water to plumbing fixtures, technological laboratory equipment and fire and outside taps.

Cold water is fed through a lead-in from the inner main system that maintains flow demand and water pressure for service, drinking and fire-extinguishing water in the building.

At the delivery point of the building a metering unit is designed for registration of water quantity and discharge consisting of a meter, stop valves and an outlet valve. The metering unit has a free line.

Main system is assembled of steel galvanized pipes suitable for water and gas.

3.3.4 Hot water supply

Water supply for hot water demands is provided through heating system mains with a decrease of temperature to 65 ºC.
Hot water is fed to plumbing fixtures and laboratory equipment.
The feeding main is not very long that is why no water circulation is stipulated.

The main system is assembled of steel galvanized pipes suitable for water and gas.
Insulation sleeves of polyethylene foam have been approved as isolation material for the feeding main excluding lead-ins to plumbing fixtures.

3.3.5 Domestic sewage

Discharge of household sewage from plumbing fixtures into the outer sewage system is mainly undertaken by sanitary sewage system provided in every accommodation space of the building.

Sanitary sewage system is assembled of polyvinyl chloride pipes.

Heating of the administrative and domestic building and other buildings and workshops is provided through the central heating system operating at a temperature of 95-70 ºC

The heating system is a two-pipe one with bottom distribution. 8 convector heaters KSM20-1,091K (КСМ20-1,091К), 1 kV power, have been approved as heaters for the administrative and domestic building.

32 convector heaters KSM20-2.182K2v (КСМ20-2.182К2в), 1 kV power, have been approved as heaters for the technological capacities building.

3.4 Technical, environmental and consumable properties of product

In accordance with SanPiN 2.1.5.980-00 «Hygienic requirements to surface water protection» the quality of treated wastewater discharged to the fish industrial water body of 1 category should correspond to facilities of deep biological purification as per following factors, stated in the table 3-5.

Table 3-5 – MPC of basic pollutants in treated wastewater

No.	Name of pollutants	MPC mg/l
1	Suspended substances	3,0
2	Biological oxygen demand (BOD)	3,0
3	Ammonium ion (NH_4^+)	0,39
4	Nitrate ion (NO_3^-)	9,1
5	Nitrite ion (NO_2^-)	0,02
6	Phosphates (P_2O_5)	2,0
7	Surface-active substances (SAS)	0,5

3.5 Process risks

Main technological risks are associated with the correct implementation of the design solutions for the WWTP.

However, since similar projects have not been realized at the Kola region yet, some problems concerning disposal of produced dry sediments can arise. There are no specialized disposal sites for such sediments in Kola, which meet all the environmental requirements for solid waste disposal sites. Methods for the further disposal or recycling of sediments should be determined based on the results of the chemical analysis.

3.6 IEP implementation plan

An enlarged IEP realization diagram is represented in the Figure 3-3 below.

Actual cost of materials used as per estimate norms and project for actually accomplished scope of work will be clarified on the basis of checks and verified by the Customer.

Supply of the constructed object with technological equipment, building materials, half-finished products and other necessary goods will be carried out by project general contractor, the winner of the open tender for the right to negotiate municipal contract for WWTP construction.

Contractor's agreement is supposed to be signed with open contract price, settling for the actually carried out work, providing by the contractor of all necessary payment accounting documents.

Furthermore it should be considered that during clearing between customer and contractor for actually carried out scope of work, the reserved for unforeseen work assets are to stay within customer disposal and are no to be given to contractor (MDS 81-35.2004 p. 4.33).

№	Name of work stage	Months											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Construction site preparation												
2	Main construction objects												
3	Auxiliary and maintenance construction objects												
4	Power facilities objects												
5	Outer water supply and sewage systems and constructions												
6	Territory amenities and amenity planting												
7	Equipment commissioning												

Figure 3-3 Project realization diagram

4 ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Description of current state of environment at the area of IEP implementation

4.1.1 Social and economic environment

The project will be realized in the urban settlement of Severomorsk-3 that is a part of urban district Severomorsk ZATO in the territory of Murmansk region. The Murmansk Region is one of the largest and most developed regions of the European North of Russia. The region is located in the Kola Peninsula. Most of its territory lies within the Arctic Circle. With the area of 145 thousand sq. km, the region represents a unique combination of abundant natural landscape, cultural and historic environment and developed economy. Advantageous geographic locations, significant natural resource potential, ice-free sea port, and proximity of the borders with the EU countries are the key factors of social and economic regional development.

The Murmansk Region has significant advantages compared to other Russian regions. This happens mostly because of its geopolitical and geographic location. The Murmansk Region is the northern gate of Russia; it links Russia with the European countries and handles huge cargo flow from our country and back.

Various natural resources exist in the region. More than 60 major fields of various minerals have been discovered in the Kola Peninsula area. Currently, nearly thirty types of fossils are produced; the most precious minerals are phosphor ore, titanium iron, aluminum, copper, nickel, zirconium, and other rare metals. The reserves of mica, ceramic raw material and raw materials for construction, facing stone, semi-precious and ornamental stones are extensive.

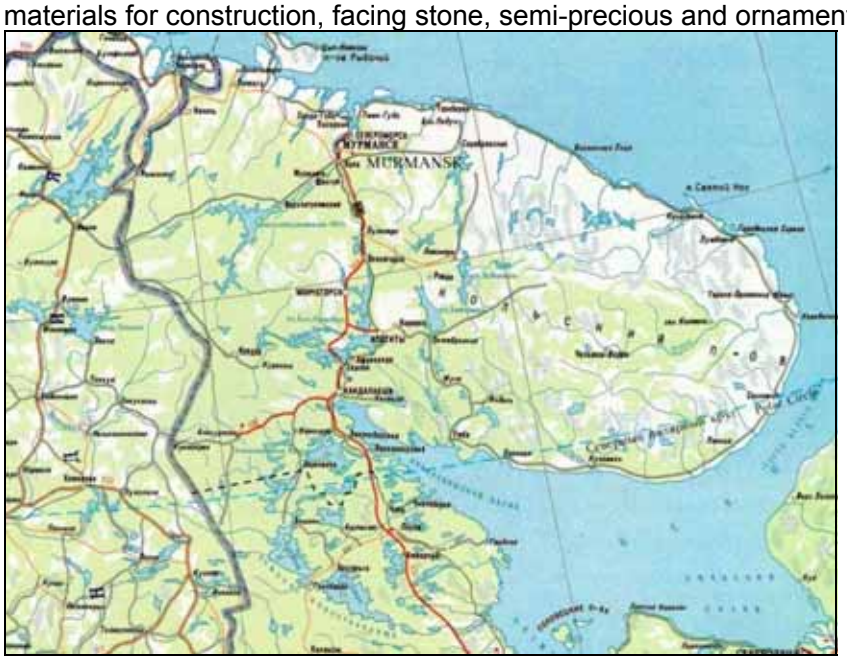


Figure 4-1 Murmansk Region map

Superb oil and gas reservoirs have been discovered in the Barents Sea in the last ten years. Shtokman gas and condensate field, with the reserves of 3.0 trillion cubic meters (tcm) of gas,

is one of them. Development of such a unique field will satisfy the gas needs of the entire North-West of Russia for many years.

The economy of the Murmansk Region is targeted to the natural resources. The region delivers 100% of the Russian production of apatite concentrate and 12% of iron ore concentrate, 14% of refined copper, 43% of nickel, 14% of the fish production.

4.1.2 Climate conditions

Natural climatic conditions of Severomorsk ZATO are characterized by long and cold winter, strong winds, low daylight and UV factor, permafrost areas, and high humidity.

Severomorsk ZATO belongs to the Atlantic Arctic temperate climate zone dominated by warm air streams from North Atlantic and cold ones from the Atlantic sector of the Arctic, which is characterized by increased cyclone frequency in cold period of the year and increased anticyclone frequency in warm period. Proximity of warm Gulf Stream conditions the abnormally high winter temperatures, large temperature differences of the Barents Sea and the continent during summer and winter months—high temperature variability during changes in wind direction. The average temperature of the coldest winter months (January and February) is –9ºC at the shore of the Kola Bay. The average temperature of the warmest month (July) varies from +10ºC to +14ºC. Duration of no-frost period at the shore exceeds 100 days, while in other areas it varies from 50 to 100 days. All of the Severomorsk ZATO area lies within the humid zone. Annual precipitation reaches 600 700 mm (at the Kola Bay shore). Height of the snow cover varies from 80 cm in the south to 40 cm and less at the Kola Bay shore, where the snow is blown off by wind. Severomorsk ZATO is characterized by frequent snowstorms. They are most frequent in the January—March period. The Severomorsk ZATO area lies in two natural geographic zones: tundra and forest tundra. There are over a hundred lakes in the Severomorsk ZATO area. The lakes as well as the rivers are the sources of water supply for the cities, towns, and enterprises of Severomorsk ZATO. The main water area of Severomorsk ZATO is the Kola Bay, where navigation is year-round. The polar night lasts from December 2 until January 12, culminating on December 22. The polar day lasts from May 22 until July 22, when the Sun does not set. Storms are most frequent in the October—March period (average annual days—70-90), fogs and precipitation are most frequent in the July—August period. Poor visibility (less than 1 mile) may be observed throughout the year, its recurrence is 5-15%. Frequent and harsh weather changes sometimes cause abundant snowfall, forming snow banks on roads (the average daily precipitation is around 40 sm) storm winds (wind force of 25 m/s and more), strong frost (temperature of –25…30ºC, glaze ice on roads and power line wires.
All the above conditions complicate the operation of business, transportation, and education facilities, sometimes breaking the power lines, complicating search and rescue operations and accident recovery work.

4.1.3 Geology and Hydrogeology

The relief of the site is relatively even and was formed during construction works over the past few years. Absolute heights directly on the WWTP construction site range from 137.5 to 140 metres.

From geomorphological point of view the site is situated in a place of plain accumulative aqueoglacial relief that can be characterized by the presence of eskers and outwash (sand) plains.

The geological structure of the survey area there are crystalline rock of Archaean age: amphibole and biotitic gneisses and granite gneisses.

At the slopes and at the feet of the rocky elevations with angular displacement there is a layer of upper-quaternary aqueoglacial (fluvioglacial) and glacial (moraine) deposits. Modern industrial filled soils occur widely.

Industrial soils formed in result of grading of the construction site and road filling. The embankment is over 15 years old. The soils are clumped. The embankment width ranges from 0.3 to 1.7 metres. The embankment was formed by:
- fine sands with lenticles of sands of diverse fineness, construction waste admixture and impurity of gravel and pebble stones up to 20%,
- gravel ground with impurity of gravel and pebble stones up to 50%
Aqueoglacial deposits comprise the main volume of the surveyed geological profile. In the geological profile sands of medium fineness and gravel sands dominate, as for fine sands and gravel grounds their amount is smaller.

The natural basis for the designed buildings and constructions will be:
- sands of medium fineness (engineering geological element 1) having the following physical and mechanical indexes: filtration index=2.0 m/day, density p=1.93t/m3, gravity γ=2.71kg/sm3, cohesion C=0.01 kg/sm2, angle of repose φ=350, deformation modulus E=300kg/sm2;
- gravel sand (engineering geological element 2) having the following physical and mechanical indexes: filtration index=3.3 m/day, density p=2.00t/m3, gravity γ=2.70kg/sm3, angle of repose φ=380, deformation modulus E=300kg/sm2.

Hydrogeological conditions are charactrerized by the presence of an underground reservoir at the depths: 1.0-2.0m at the site and 0.1-2.0m at the routes of outer networks. Ground waters are free-flow and are hydraulically connected with the waters of the Srednyaya river. During snow melting period the level of the ground waters may rise 0.5-1.0m higher than the indicated levels. Corrosivity of the ground waters to concrete is low; to lead cable covers – high; to steel – medium.

The depth of ground seasonal freezing is 1.9m.

4.1.4 Air

In Severomorsk ZATO, the greatest share in atmosphere pollution do the organized pollution sources of 6 heat districts – enterprise “Severomorsk heat networks” and 50 small boiler houses of Defense Ministry which run on stove fuel and coal, mobile sources – 20 thousand vehicles. Emission, produced by North navy ships and air force, can’t be estimated.

In atmosphere air emission of industrial enterprises are exposed by a complex of meteorological factors, which influence the existing level of the pollution. The dispersion of pollutants in Cola Peninsula mainly depends on active cyclonic activity with moderate or heavy winds. North-West of RF European part is categorized as favorable area for air pollution dispersion.

At anti-cyclonic season with weak winds and lowed inversions with gauzes in cities and industrial centers of Murmansk region increased level of pollution concentrations can be observed.

Atmosphere pollution index on the territory of Severomorsk ZATO is 3. It is less than the average index in the country. The lower potential of atmosphere pollution determines transfer and dispersal of impurity substances disposed into air basin of Kola Peninsula cities, and creates favorable conditions of contaminants dispersion.
This day ambient air condition in the region evidences the satisfactory state. Nevertheless the total emission of contaminants from both organized and unorganized sources is around 15.000 ton a year i.e. 190 kg a year/habitant.

The background concentrations of contaminants in ambient air of Severomorsk are shown in Table 4-1 below.

Table 4-1 Background concentrations of contaminants in ambient air of Severomorsk

Substance	Concentration, mg/ m^3
Carbon oxide	2,6
Nitrogen dioxide	0,06
Suspended substances	0,2
Sulphur dioxide	0,03

4.1.5 Surface water

There are more than 127 thousand hydro objects on the Kola Peninsula including 20,6 thousand stream flows, 107 thousand water reservoirs including lakes of Imandra, Umbozero, Lovozero, reservoirs at Tuloma, Voronya, Teriberka rivers. The region is very rich with water resources.
Regular monitoring of water reservoirs quality is carried out by Murmansk UGMS with frequency of 6-12 times per year at 55 regional rivers, lakes, springs and reservoirs.

It is very specific for the natural waters to include metal ions such as cupper, iron and manganese. High concentrations of metals when no water discharge form industrial enterprises takes place can be observed in low-water season when feeding is primarily done by ground waters.

However industrial activity at Kola North leads to pollution of water reservoirs by sewage waters as well as by dust emissions coming to water with rainfall. High and extremely high water pollution levels by metals, sulfates, ditiophosphate, nitrogen and phosphorus compounds, organic substances are limited and can be observed in small water objects. Rivers Nadui (Monchegorsk) and Kolos-yoki (Nikel) are classified as chronically polluted water objects due to they are exposed to direct water discharge from non-ferrous metallurgy companies without sufficient treatment.

Sewage water from enterprises, institutions organizations and military units located on the territory of Severomorsk ZATO is disposed in inner water basins via own and municipal sewer systems. Into surface water basins, the city of Severomorsk disposes 7,9 million m^3 of untreated sewage water. End receiver of rivers and brooks of fish-industrial importance is Kola Bay. That has a pernicious influence on reproduction of his biological resources. For last 10-20 years, some species of bottom fishes have become rare ones.

Table 4-2 The amount of pollutant discharge into the Srednyaya river

No.	Pollutant name	Average annual concentration mg/l	Mass of discharged pollutants t/year	Max. permissible discharge t/year	Preliminary approved discharge t/year	Times of max. permissible discharge exceedence
	TOTAL (tons):		**80.0**			
1	Suspended elements	14.5	9.3	2.33	10.76	4.0
2	TBOD	14.4	9.20	2.15	10.76	4.3
3	Dry residues	56.8	36.31	43.03	-	-
4	Chlorides	17.9	11.42	14.34	-	-
5	Sulphates	13.7	8.8	10.76	-	-
6	Oil products	0.5	0.31	0.04	0.36	7.8
7	Ammonium ion	4.9	3.14	0.46	3.59	6.8
8	Nitrite ion	0.07	0.04	0.06	-	-
9	Nitrate ion	1.44	0.92	1.43	-	-
10	Phosphates	0.54	0.4	0.14	0.43	2.5
11	Synthetic surfactants	0.17	0.11	0.14	-	-

Annually **547,000 m^3** of sewage waters containing **80 tons** of pollutants are duscharged into the Srednyaya by production and social objects through the existing sewage system of Severomorsk-3. The excedence of pollutants in sewage waters is represented in table 4-2 above.

4.1.6 Soils

The main reasons for soil contamination is industrial and domestic waste as well as industrial enterprese discharges (aerogenic pollution). The problem of waste management (6 domestic waste landfills, 14 authorized dumps and 117 unauthorized dumps are functioning in the territory of Murmansk region) is at present the most burning issue. Pesticides are restrictedly used mainly in protected ground. During laboratory soil tests no pesticide detection cases were registered.

In accordance with the effective normative-legal acts: Federal Law “About sanitary-epidemiological safety of population” dated 30.03.1999 No. 52-FL with addenda and amendments, art. 21; SanPiN 2.1.7.1287-03 “Sanitary-epidemiological requirements as to soil quality”; GN 2.1.7.2041-06 “Maximum permissible concentration (MPC) of chemical substances in soil”; GN 2.1.7.2042-06 “Guiding permissible concentration (GPC) of chemical substances in soil” – the control of observance of requirements of sanitary legislation as to soils, maintenance of territories of urban and country supplements, accomplishment of measures on prevention of soil pollution.

In year of 2008, the soil examinations were carried out on all administrative territories, including Severomorsk ZATO. As compared with 2007, specific weight of samples exceeded sanitary standard of the heavy metals’ content in soil has been reduced.

The districts of region have been ranked taking into account K_{sum} – a summary index of soil pollution (Table 4-3). In accordance with the accomplished ranking, the territory of the Severomorsk ZATO takes the second place as to soil pollution grade.

Table 4-3 Ranking of region territories basing on soil pollution index (K_{sum})

Territory	Summary index of soil pollution Ksum
Kovdorskiy district	0,14
ZATO Polyarniy	1,23
Terskiy district	1,37
Apatity town	2,24
Kandalaksha town	2,27
Olenegorsk town	2,7
Kirovsk town	3,0
ZATO Skalistiy	3,02
Lovozerkiy district	3,62
ZATO Zaozersk	5,1
Monchegorsk town	6,0
the city of Murmansk	7,72
Kola District	10,32
ZATO Severomorsk	**32,8**
Pechengskiy district	45,92

4.1.7 Demographic situation and population health

Demographic situation and population health in Murmansk region as well as in Russia in whole becomes worse and is determined by low birthrate and life expectancy, high death and sickness rate. For the year 2007 Region population decreased for 5902 people and by the 01.01.2008 it accounted 850 929 people (fig. 4-1).

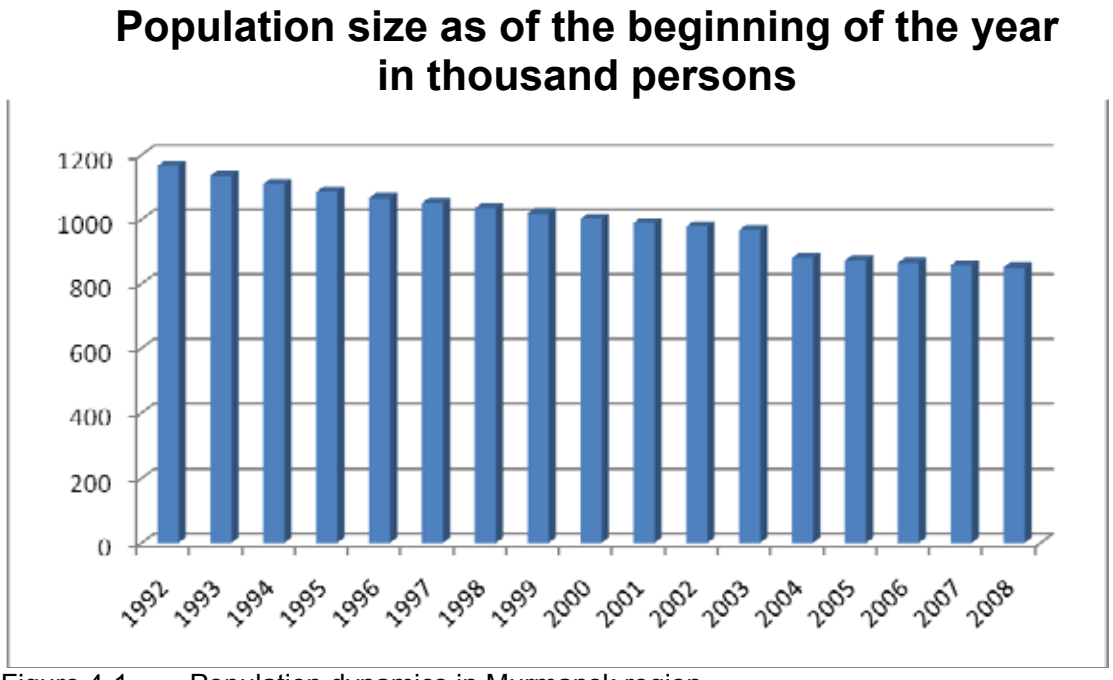


Figure 4-1 Population dynamics in Murmansk region

Children above 14 make 122,534 people (14.4%), persons over working age – 126,788 people (14.9%). There is a regressive type of age distribution formed and maintained in the region. Middle age of population in the region is 36.1 years.
Generally the Murmansk region has the same demographic modernization problems as other regions of the North-West Federal District:

- Decrease in population due to the high death rate and low birthrate;
- Ageing of population due to low birthrate and rising death rates at working age;
- High death rate at working age and subsequent large gap in male and female life expectancy, as well as decrease of general index of life expectancy

Dynamics of reproduction processes in Severomorsk ZATO in the period from January to November 2006-2007 can be viewed in the table below:

Table 4-4 Dynamics of reproduction processes

	People quantity		**Growth rate January – November 2007 in accordance with January – November 2006,%**	**Per 1000 people**	
	2006 (January - November)	**2007 (January - November)**		**2006 (January - November)**	**2007 (January - November)**
Were born	702	692	98,5	10,4	10,3
Died	578	472	81,7	8,6	7,0
Natural increase	124	220	177,4	1,8	3,3
Registered marriages	524	590	112,6	7,8	8,8
Registered divorces	511	448	87,7	7,6	6,7

One of the constraints to increase of birth rate is social and demographic problems of career servicemen. In connection with despondency of life conditions and low money allowance the more military people live unmarried or have families with low number of children. Average age of Severomorsk ZATO has tendency to increase. Quantity of pensioners and their share in total quantity of population within last years is invariably increasing.

High death rate of population is connected with untimely death rate of blood circulation illnesses, high men death rate of accidents, traumas and poisonings, as well as high death rate of new growth.
Basic reasons of population health level and demographic situation decrease still remain: social stratification and poverty, increase of unemployed people amount, unbalanced structure and quality of food, adverse working conditions of employees, negative environmental and natural climatic conditions.

According to data of Directorate of state population placement service in Murmansk region as of March 03, 2009 total unemployment accounted 14963 people (as of February 01, it was 13178 people). Level of the registered unemployment (to economically active population) amounted 3%.

Quantity of employees supposed to be fired in accordance with staff reduction, liquidation according to data of enterprises themselves amount 1998 people.

Quantity of employees being on unpaid vocation as of March 03 amounts 128 people. Those who are idle because of employer's fault – 305. As far as vacancies concern Severomorsk ZATO is in the third place in Murmansk region: in Murmansk (2944), Kola district (526), Severomorsk (368), Kandalaksha (240), Pechengskiy district (171).

4.2 Requirements of environmental legislation

Waste water discharge is done into the fishery objects. Environmental legislative requirements applicable to the IEP are located in the following documents:

- Water Code of RF № 74-FZ, 03.06.2006

  «Article 60, paragraph 6. When hydroeconomic system is being used it is prohibited:
  1) discharge waste waters into hydro object without sanitary treatment, disinfection (taking into account impermissibility of exceeding water pollution standards and maximum admissible concentrations of hazardous substances in hydro objects), as well as it is prohibited to discharge waste waters which are not in compliance with technical regulations»
- GN 2.1.5.1315-03 «Maximum admissible concentrations (MAC) of chemical substances in hydro objects for drinking-economic and cultural-domestic usage» (dated 30 April 2003, revision 28 September 2007)

  «Paragrph 1.2. This standard is applicable at all RF territories and sets forth maximum admissible concentrations of chemical substances in water of hydro objects for drinking-economic and cultural-domestic usage »
- SanPiN 2.1.5.980-00 Hygienic requirements for superficial waters protection (dated 22 June 2000)

  «4.1. For the purpose of hydro object protection from pollution it is prohibited:
  4.1.1. To discharge in the hydro objects waste waters (industrial, economic-domestic, rainwaters ect) which:
  - can be avoided by arranging for low-waste production, lean production, water reuse systems after pertinent treatment and disinfection in industry, agriculture and urban activity.
  - include causal infection organisms of bacterial, virus and parasite nature. Waste waters which are hazardous due to epidemic criteria can be discharged into hydro objects only after pertinent treatment and disinfection to reduce the number of termotolerable coliform bacteria down to CFU/100 ml $\leq$ 100, of overall number of common coliform bacteria CFU/100 ml $\leq$ 500 and number of coliphage CFU/100 ml $\leq$ 100;
  - contain substances (or their transformation products) which do not have established hygienic MAC or ODU nor methods of their determination;
  - contain highly hazardous substances for which the standard does not allow any amount».
- SanPiN 2.1.4.1074-01 "Drinking water. Hygienic requirements for water quality in centralized drinking water supply systems. Quality Control. Sanitary-Epidemiologic rules and standards"

  «Paragraph 2.2. Quality of drinking water fed in by the water supply system shall be in compliance with this sanitary rules».
- GOST 30813-2002 Water and water preparation. Terms and definitions, dated 12 November 2002.
- Rules for usage of municipal water supply and sewage systems in Russian Federation (revision dated 23 May 2006)

- Government Act dated 12 February1999 N 167 Rules for acceptance of industrial waste waters in municipal sewage systems

«This Rules regulate relationship between customers and water pipeline- sewage system owners in part of usage of centralized water supply and sewage systems of populated places»

4.3 Description of considered alternatives

Zero option

The suggested project solves the problem of sewage water treatment from Severomorsk-3 that are at present discharged into the Srednyaya river and therefore cause environmental, sanitary and epidemiological stress. In these conditions, the construction of sewage treatment facilities for the Severomorsk-3 only allows to provide the normal functioning of disposal objects and consequently to improve sanitary-epidemiological and environmental situation. Thus refusing a construction of the sewage treatment facilities is not acceptable.

Treatments methods

According to the paragraph 9.35 of RF construction norms SNiP 2.04.03-85, for sewage treatment biological, biological and chemical, physical and chemical methods can be applied. The method selection can be determined by its technical and economical indicators, sewage discharge conditions, transportation network availability, district development, type of the residential area (permanent or temporary), reagents availability etc.
According to the paragraph 9.44. of SNiP 2.04.03-85, installations for physical and chemical treatment and biological and chemical treatment are preferable for temporary settlements, preventative clinics and settlements with high diversity of sewage content, low temperature and concentration of pollutants.

Based on SNiP 2.04.03-85, together with practical experience gained for number of years in communal sphere, input data about the settlement type, uniformity of coming sewage, quality of the coming waters and quality of the treatment, conditions of the water discharge etc. biological method of treatment has been selected for the project as the most technically and economically justified.

4.4 Characteristic of sources and types of environmental impact

For estimation of impact level resulted from the project implementation, it is necessary to pick out main project stages. The project stages imply activities which will be different in their scale, influence scope and exposure; therefore the impact grade will be different in each of stages.

The project has been divided into stages as follow:

- Construction
  - Buildings' construction and application of communications
  - Equipment mounting
- Operation
  - WWTP operation in Severomorsk-3 in normal mode

Based on the information gathered at the moment of estimation, the possible impact on environment and population is presented below.

Table 4-5: Possible impacts on environment and population arisen from project's implementation

Planned works: → / Impact on: ↓	Preproject preparation	Construction	Operation
Environment:			
Soils			
Surface water			
Subsoil water			
Air			
Wildlife			
Flora			
Fauna			
Social and economic environment			
Forced resettlement			
Transport			
Economic development			
Economic development			
Health and safety of population			
Health and safety of staff			
Nature and culture heritage			

Impact level
Heavy (negative)
Medium (negative)
Weak (negative)
Neutral
Positive effect

Expected positive consequences

As for positive *environmental consequences*, project realization will significantly decrease the amount of pollutants contained in the discharged sewage waters.

As for soicial consequences, the realization of the project will

- Increase environmental safety of the population residing near the river;
- Provide working places for a part of the population of Severomorsk ZATO (altogether 32 working places are planned).

During project's implementation, the negative effects on environment and population are unavoidable too. Description of the negative effects on environment and population is shown in the table below:

Table 4-6 Expected negative impact on environment and population

Production processes	Possible impact on:	Description
Строительство		
Construction work	Soils Subsoil water Air Flora Health of staff Traffic flows	Construction works will directly influence upon soils and subsoil water – digging a ditch, removal of topsoil and vegetation under building up; air - building machinery emission; health of staff – it suffers from emission of pollutants
Transportation of new equipment	Air Traffic flows Health of staff	Most likely that transport of new equipment will be carried out by trucks running on diesel fuel. Diesel engines are distinguished by the higher soot emission. Soot is saturated with carcinogenic hydrocarbons and microelements; their emission to atmosphere is inadmissible. Since truck waste gases are disposed to the lower atmosphere and process of their dispersal is essentially different from the dispersal processes of the higher stationary sources, harmful substance are practically in the zone of breath. Besides, at the time of transportation of new equipment, the load on current traffic flows increases lightly. However, it should be mentioned that any impact in construction stage have a temporary and local character.
Installation of new equipment	Health and safety of staff	In course of new equipment's installation, the work-related injuries of the staff engaged to mounting are possible.
Planning a territory, asphalt work	Soils Vegetation Health and safety of staff	Works connected with improvement of territory can entail an insignificant impact on soils (for example, removal of topsoil (0-5 cm) as well as on vegetation.
Operation		
Treatment processes	Ambient air Health of staff	During operation of Wastewater Treatment Plant, the negative effects are possible as follow: - presence of objectionable odors at the mechanical treatment facilities due to anaerobic destruction of organic waste which begins in the sewage networks and septic; - emission of metabolism products to atmosphere; - emission of pathogenic microflora to atmosphere in airing processes;

Production processes	Possible impact on:	Description
Application sewage to WWTP	Soils Ground Subsoil water	Sewage leakage into ground as a result of seal failure of pipeline and fitting joints.
Operation of treatment facilities	Health and safety of staff	During operation of sewage treatment facilities, the work-related injuries of the staff are possible (for example, in repair works) Noise and vibration in zones where electro-mechanical equipment runs.

Please find a more detailed description of the above mentioned impact below.

4.4.1 Impact on air

The WWTP site has been selected on the leeward side related to the residential construction and other enterprises of the settlement of Severomorsk-3 and is separated from them by a 400-meter sanitary protection zone.

The main block building is equipped with induced draft systems of general ventilation and the systems of local devices of suction from the distribution chamber, the sewage water strainer.

The exploitation of the projected sewage treatment facilities will be accompanied by the emissions of pollutants to the atmospheric air, and according to expert estimates will be characterized by the following values:

Table 4-7 Emissions of pollutants to the atmospheric air when the WWTP is under operation

Name of substance	Max. emission (g/s)	Total emission (t/year)
1	2	3
Sulphurated hydrogen H2S	0.0000007685	0.0000242368
Ammonia NH3	0.0000005288	0.0000166815
Ethyl mercaptan C2H6S	0.0000000005	0.0000000159
Methylmercaptan CH4S	0.0000000013	0.0000000431
Carbon monoxide CO	0.0000376089	0.0011841650
Nitrogen dioxide NO2	0.0000019504	0.0000615097
Methane CH4	0.0001447256	0.0007043100

The calculation of pollutants dispersion is not reasonable in connection with the insignificant volume of emissions.

4.4.2 Impact on water bodies

The many-stage scheme of total biochemical sewage water treatment with primary denitrification, deep nitrification and subsequent decontamination approved for WWTP construction will provide for functional reliability of the complex, highly effective treatment of the sewafe water arriving at the WWTP and reliable protection of the water object from pollution. The effectiveness of decontamination according to treatment stages can be seen in table 4-8. The approved sewage water treatment technology with primary denitrification and deep nitrification cares for dicrease of biological elements contained in sewage waters to the

preliminary approved discharge quote that in its turn helps to dicrease anthropogenic impact on the water object.

Table 4-8- Change in pollutant concentration according to treatment stages

No.	Index name	Incoming water	After mechanic treatment constructions	After biologic treatment constructions	After two-stage bioreactor	After brush filter	After purolat filter	Preliminary approved discharge
1	Suspended substances, mg/l	260	234	15.0	8.0	5	3	3
2	TBOD, mg/l	300	285	15.0	8.05	5	3	3
3	Ammonia nitrogen, mg/l	32	32	1.0	0.5	0.2	0.2	0.39
4	Nitrite nitrogen, mg/l	-	-	0.02	0.02	0.01	0.01	0.02
5	Nitrate nitrogen, mg/l	-	-	9.1	9.1	9.1	9.1	9.1
6	Phosphates P_2O_5, mg/l	13.2	11.88	4.75	4.75	0.46	0.46	0.5
7	Phosphates in respect of (P), mg/l	5.28	4.75	1,9	1,9	0,2	0,27	0,2

*- depends on the applied state standard reference materials

For the diagram of change in pollutant concentration in sewage waters according to treatmnet stages refer to Appendix 2.

4.4.3 Waste management

Calculated amount of waste the forming of which is planned in the process of construction and exploitation of the treatment facilities are presented in the summary table 4-8:

Table 4-9 Estimated volumes of wastes

Code according to FCCW (Federal Classification Catalog of Waste)	Name of waste	Hazard Class	Activity in the process of which the waste is formed	Guide volumes of waste formation, t/year
Operation period				
943 000 00 00 00 0	Waste (sediments) at mechanical and biological sewage water treatment	It will be specified in the process of exploitation, not stated	Sewage water treatment	190.00
912 004 00 01 00 4	Waste from utility premises of organizations – unsorted (excluding bulk waste)	4	Personnel life activity	15.2
353 301 00 13 01 1	Mercury lamps, luminescence mercury-containing tubes – used and defective ones	1	Lighting of the premises	0.00027
912 000 00 00 00 0				
912 006 0101 00 4	Construction waste	4	Object construction	25,9
Total:				for the exploitation period – 205.20 t; for construction period – 25.9 t
943 000 00 00 00 0	Waste (sediments) at mechanical and biological sewage water treatment	It will be specified in the process of exploitation, not stated	Sewage water treatment	190.00

Collection and temporary storage of waste formed during construction will be performed on a specially provided site. According to accumulation the construction waste will be removed by the enterprise having license for this type of activity. Part of construction waste (construction macadam, sand waste) and soil formed in course of excavation work is used on construction site for the back filling of the pits and leveling of the site.

Waste from utility premises of organizations – unsorted (excluding bulk waste), waste similar to domestic waste (sweep from the territory) are piled into metal containers located on the site with hard coating and are removed by the enterprise having license for this type of activity.

Used mercury lamps are piled in the prefabricated package in a separate premise, are removed according to accumulation by the enterprise having license for this type of activity.

Waste (sediments) at mechanical and biological sewage water treatment are temporarily stored on the treatment facilities territory in a specially provided place until the transfer of the said waste to the specialized organization. Waste (sediments) at mechanical and biological sewage water treatment are planned to be transferred on a contractual basis to the specialized enterprise (organization) having a relevant license for the activity in the sphere of hazardous waste treatment.

4.4.4 Land protection

Assembly of the treatment facilities and the construction of separate elements have allowed to locate them on a relatively small area of 1 ha. The site for WWTP location has been selected on the lands not suitable for agriculture, not having fertile soil layer.

4.5 Measures for prevention of unfavorable environmental impacts of IEP implementation

Prevention and mitigation measures are shown in Table 4-10 below:

Table 4-10 Impact to environment and staff caused by production processes and proposed measures

Production processes	Impact	Risk	Prevention /mitigation measures
Construction works	Soils – topsoil removal Vegetation – vegetation removal	High	Improvement of territory: additional gardening, creation of artificial landscape
	Staff – work-related injuries	Medium	In course of execution of construction and installation work, teaching all the co-workers at the object in accordance with SNiP 12-04-2002.
	Soils, surface and subsoil water, vegetation, staff - during activity related to waste treatment	High	Waste being gathered in course of construction should be accumulated in specially allotted place. Dangerous waste (1-3 class) should be stored in safe conditions: mercury lamps – within a closed metal container, waste oil and chemicals - in a sealed container with tray etc). All waste should be removed from the object's territory in proper time.
	Ambient air – emission of pollutants by transport	Medium	Since this impact has temporary and local character and concerns contract enterprises, so any special measures from the side of project operator do not required.

Operation	Ambient air pollution	High	WWTP site should be chosen upon leeward of residential area and other enterprises of the city of Severomorsk. It should be also considered a sanitary buffer zone 400 m wide in accordance with Sanitary-epidemiological norms and regulations SanPiN 2.2.1/2.1.1.1200-03 “Sanitary buffer zones and sanitary classification of enterprises, constructions and other objects.” Main block of the sewage treatment facilities should be allocated in a building equipped with combined extract and input systems of general ventilation, as well with local units of suction from distribution chamber, sewage percolator. Also filters for air deodorization and neutralization should be installed.
	Surface water pollution	High	Sewage treatment system should bi designed in such a way that it will able to provide a reliability of the complex’s operation and higher effectiveness of treatment of applied to WWTP sewage and effective protection of a water object against pollutants. Previously decontaminated and dewatered waste should be removed by special motor transport regularly. For the purpose of prevention of equipment failures, its backup should be provided. Multi-stage treatment system is to prevent uncontrolled “breakthrough” of dirty or insufficiently treated sewage water.
	Noise impact on staff	High	For silencing and reducing a noise impact on workers, the should be taken, for example: - pumping stations are placed at the facility wherein is no personnel in normal operation; - the most part of operating pumps – submersible ones with reduced noise level.

	Work-related injuries of the staff Staff suffers from emission of pollutants at the object	Medium	Basing on the identification of dangers and risks for health of WWTP staff in operation of the object, it is necessary to develop a plan of labor protection including a register of risks, as well as to apply the mitigation measures according to the developed register of risks.

4.6 Environmental effectiveness of IEP

The project implementation will allow:

- A decrease in the content of pollutants in the WWTP effuent on average 4 times related to suspended substances, 4 times related to BOD, 7 times related to oil products, 7 times related to nitrites, 2.5 times related to phosphates;
- An improvement of the sanitary state of the water body, quality of water in the river itself and in the system of lakes through which it flows, and in the Kola Bay;
- An improvement of the conditions for the reproduction of fisherie resources in these water bodies.

4.7 Justification of necessity to perform additional engineering surveys

Design and estimate documentation and a favourable conclusion of the state extradepartmental inspection for this project are available. The available data on the engineering solutions for the WWTP construction project in the settlement of Severomorsk-3 are considered sufficient.
After WWTP commissioning methods of its further location and use shall be determined according to the chemical test results of precipitation.

4.8 Draft of the List of environmental conditions

In course of designing, construction and operation of the object, the environmental requirements to the object should be taken in consideration, whose short list is presented below:

- Observance of key requirements of sanitary protection zone (for example, absence of objects residential area as well enterprises of food and pharmaceutical industries in the sanitary buffer zone of the design WWTP)
- Observance of key requirements regarding operations in water protection zone.
- Minimization of emission from stationary and mobile sources (compliance with permissible limits)
- Minimization of noise impact (compliance of noise level with permissible limits)
- Organization of industrial, domestic and storm water drainages providing for minimization of surface, subsoil water and relief pollution (compliance of pollutants' concentration with permissible limits)
- Waste disposal with regard to the safe conditions for environment (compliance of disposed volume with permissible limits and approved conditions of disposal).
- Minimization of waste / maximum recycling
- Norm-setting of impact on sewage treatment facilities (discharges, emission, waste and noise)
- Payable impact on sewage treatment facilities (discharges, emission, waste and noise)
- Safe handling chemicals
- Providing the safe labor conditions (observance of safety measures, providing the proper labor conditions, including work area air control).

5 FINANCIAL EFFICIENCY OF INVESTMENT ENVIRONMENTAL PROJECT

The financial analysis concentrates on assessing the financial feasibility of the proposed investment. The analysis will be based on constant prices, meaning that the effects of inflations are excluded from the analysis, which makes it possible to compare the costs and revenues in different years.

To be able to assess the financial feasibility of the Sewage Water Treatment Plant, the investment and costs of waste water treatment involved in the new plant, will be compared to the additional revenues to be generated by calculating the Net Present Value of these numbers with a discount rate of 13% (source CIA World Fact Book).

Paragraph 5.1 will first elaborate on the required investments. The next session assesses the additional revenues, whereas the additional costs are presented in paragraph 5.3. In the final section these numbers are compared by calculating the Net Present Value.

Analysis of financial feasibility of the project has been accomplished basin on the data provided by MUE “Severomorskvodokanal” and Company “Ecos” which had been considered as reliable data.

5.1 Value and structure of investment to IEP

WWTP to be constructed near Severomorsk-3 will treat 1.500m³ of water a day. The amount of investment secured for the construction of all the sewage treatment facilities is generally estimated at 280 mln rubles. WWTP construction employs 7 stages:

1. Site preparation;
2. Main construction / building construction;
3. Axiliary building construction;
4. Power supply;
5. Outer network construction;
6. Amenities
7. Point start-up and adjustment.

For details on estimated investment for the construction of the object see the table below.

Table 5-1 Investment amount for the construction

№№	Name	Estimate cost in thousands of rubles
1	2	3
1. Site preparation		
LC №1	Development works	1 715
2. Objects of main construction		
OC №1-1	Construction of technological tanks building.	143 474
OC №1-2	AOF building construction	4 816
OC №1-3	Balance tank construction	4 291
OC №1-4	Sludge sites construction	3 743
OC №1-5	Construction of dehydrated sediment site	585
OC №1-6	Construction of sand sites	580
OC №1-7	SLS construction	2 981
3. Objects of utility and servicing purposes		
OC №2-1	CP (Checkpoint) construction	1 340
OC №2-2	Garage construction	431
OC №2-3	Storage facilities construction	433
4. Energy economy objects		
LC №4	Transforming substation construction	2 708
5. Outer networks and constructions		
OC №6-1	On-site networks	6 539
OC №6-2	Off-site networks	12 731

№№	Name	Estimate cost in thousands of rubles
1	2	3
ОС №6-3	Bank outlet construction	343
6. Site improvement and planting of greenery		
LC № 7-1	Leveling operation	1 319
LC № 7-2	Arrangement of pavements and coatings	5 064
LC № 7-3	Planting of greenery on the territory	1 341
LC № 7-4	Small forms	2 442
7. Others		
Temporary buildings and constructions (3.8% according to GSN (State Construction Norms)-81-05-01-2001 clauses 5,3,5)		4 623
Other works and expenses (performance of works in winter time 3.4%x1.4x1.05, snow control 0.3%, job sharing 1.8%, premium for commissioning 1.81%, voluntary insurance 2%, balancing and commissioning TH and APCS (Automatic Process Control System)		22 887
Management composition (technical supervision 1.4%)		3 141
Project and surveying works		4 898
Unforeseen costs (2% according to MDC 81-35.2004 clauses 3.5.9.1)		4 648
Taxes and obligatory payments (18% VAT)		42 673

The construction shall take not more than a year; in a year the sewage treatment facilities shall be put into operation. The plan of all construction stages and payment schedule are represented below.

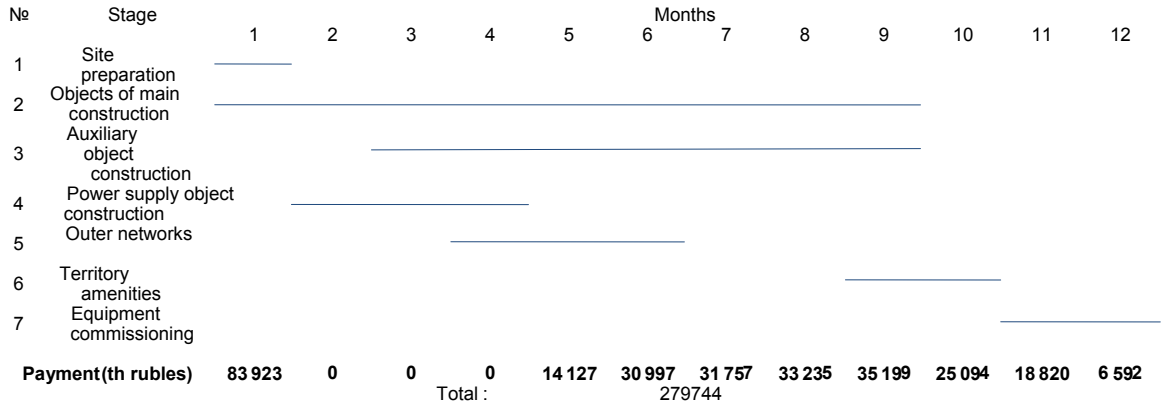


Figure 5-1 Construction and payment schedule

5.2 Expected income of the project implementation

The projected additional financial revenues because of the new Sewage Water Treatment Plant for the next ten years are shown in the table below, starting in the year of operation of the new plant (2011).

These revenues are based on a current tariff of 3.81 RUR per m³ (2009) excluding VAT, which is charged for the transportation of waste water. This tariff is expected to increase with inflation (9%) every year. As the waste water will also be treated, the tariff is expected to increase with an additional 31% in 2010 and 2011 and 21% in 2012 (meaning a total increase including inflation of 40% and 30% in 2010-2011 and 2012 respectively) to cover the additional costs involved in waste water treatment. Subsequently, the tariff after ten years after start-up of the new plant will be 21.11 RUR per m³.

Table 5-2 Estimated additional revenues

Наименование	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Water discharge (thousand m³)	9 920	9 920	9 920	9 920	9 920	9 920	9 920	9 920	9 920	9 920	9 920
Tariff per m³ (excl. VAT)	7,48	9,72	10,59	11,55	12,59	13,72	14,95	16,30	17,77	19,36	21,11
Of which allowances to WWTP	1,55	2,92	2,92	2,92	2,92	2,92	2,92	2,92	2,92	2,92	2,92
Additional revenues (000 RUR)	**`15 356**	**29 000**	**29 000**	**29 000**	**29 000**	**29 000**	**29 000**	**29 000**	**29 000**	**29 000**	**29 000**

The following assumptions have been made for estimation of additional revenues:

- The additional revenues are based on the water discharge volumes per year and the allowances for the WWTP. This means that inflation for O&M is not taken into account in the additional revenues.
- Allowances for WWTP have been calculated as a difference between existing and premium rate.

5.3 Evaluation of expenses for production

The Operation & Maintenance (O&M) costs of the new plant consist of:

- Power supply;

- Wages including Unified Social Tax;
- Expenses for reagents/coagulant, reagents/flocculant, reagents/ethane diacid;
- Water purchases;
- Residue transportation;

Reparation (including equipmentas and pipelines)

The following table presents the O&M costs from the start up of the plant for the duration of ten years. Inflation for O&M has not been taken into account.

Table 5-3 Estimated O&M costs WWTP

Project year		1	2	3	4	5	6	7	8	9	10	11	12
Calendar year:		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Эксплуатация													
O&M	RUR	0	2 747 734	2 747 734	2 747 734	2 747 734	2 747 734	2 747 734	2 747 734	2 747 734	2 747 734	2 747 734	2 747 734
Wages	RUR	0	1 535 854	1 535 854	1 535 854	1 535 854	1 535 854	1 535 854	1 535 854	1 535 854	1 535 854	1 535 854	1 535 854
Reagents/ coagulant	RUR	0	261 666	261 666	261 666	261 666	261 666	261 666	261 666	261 666	261 666	261 666	261 666
Reagents/ flocculant	RUR	0	75 434	75 434	75 434	75 434	75 434	75 434	75 434	75 434	75 434	75 434	75 434
Reagents/ ethane diacid	RUR	0	7 742	7 742	7 742	7 742	7 742	7 742	7 742	7 742	7 742	7 742	7 742
Equipments maintenance	RUR	0	13 739	13 739	13 739	13 739	13 739	13 739	13 739	13 739	13 739	13 739	13 739
Residue transportation	RUR	0	23 433	23 433	23 433	23 433	23 433	23 433	23 433	23 433	23 433	23 433	23 433
Amortization	RUR	0	0	0	0	0	0	0	0	0	0	0	0
Maintenance costs	RUR	0	5 245 200	5 245 200	5 245 200	5 245 200	5 245 200	5 245 200	5 245 200	5 245 200	5 245 200	5 245 200	5 245 200
Total		0	9 910 802	9 910 802	9 910 802	9 910 802	9 910 802	9 910 802	9 910 802	9 910 802	9 910 802	9 910 802	9 910 802

5.4 Indices of financial efficiency of IEP

The funds flow analysis based on the above mentioned estimates is done in view of next 10 years stipualted that the existing prices stay at the same level for the estimate of the project economic feasibility for the construction of the water treatment plant (1,500 m³/day). The following parameters are used in the analysis:

- Internal Rate of Return (IRR). This parameter calculates the profitability of a series of cashflows. It is the interest rate at which the costs of investments lead to benefits of the investment. An investment is considered acceptable if its IRR is greater than the minimum acceptable rate of return (often the cost of capital, e.g. the CIRR which is 2.85% (source: OECD) in the EU region);
- Net Present Value. A positive NPV means that the proposed investment is acceptable, given a certain discount rate (13% in this case);
- Payback period. This parameter calculates the period of time required to return the on investment to repay the sum of the original investment. The shorter the payback period, the more preferable the investment.

The cashflow analysis is summarised below.

Table 5-4 Cash flow analises

Project year		1	2	3	4	5	6	7	8	9	10	11	12
Calendar year:		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Эксплуатация													
O&M	RUR	0	2 747 734	2 747 734	2 747 734	2 747 734	2 747 734	2 747 734	2 747 734	2 747 734	2 747 734	2 747 734	2 747 734
Wages	RUR	0	1 535 854	1 535 854	1 535 854	1 535 854	1 535 854	1 535 854	1 535 854	1 535 854	1 535 854	1 535 854	1 535 854
Reagents/ coagulant	RUR	0	261 666	261 666	261 666	261 666	261 666	261 666	261 666	261 666	261 666	261 666	261 666
Reagents/ flocculant	RUR	0	75 434	75 434	75 434	75 434	75 434	75 434	75 434	75 434	75 434	75 434	75 434
Reagents/ ethane diacid	RUR	0	7 742	7 742	7 742	7 742	7 742	7 742	7 742	7 742	7 742	7 742	7 742
Equipments maintenance	RUR	0	13 739	13 739	13 739	13 739	13 739	13 739	13 739	13 739	13 739	13 739	13 739
Residue transportation	RUR	0	23 433	23 433	23 433	23 433	23 433	23 433	23 433	23 433	23 433	23 433	23 433
Amortization	RUR	0	0	0	0	0	0	0	0	0	0	0	0
Maintenance costs	RUR	0	5 245 200	5 245 200	5 245 200	5 245 200	5 245 200	5 245 200	5 245 200	5 245 200	5 245 200	5 245 200	5 245 200
Total		0	9 910 802	9 910 802	9 910 802	9 910 802	9 910 802	9 910 802	9 910 802	9 910 802	9 910 802	9 910 802	9 910 802
Construction													
Development works	000 РУБ	1 715	0	0	0	0	0	0	0	0	0	0	0
Construction of technological tanks	000 РУБ	143 474	0	0	0	0	0	0	0	0	0	0	0
AOF building construction	000 РУБ	4 816	0	0	0	0	0	0	0	0	0	0	0
Balance tank construction	000 РУБ	4 291	0	0	0	0	0	0	0	0	0	0	0
Sludge site construction	000 РУБ	3 743	0	0	0	0	0	0	0	0	0	0	0
Construction of dehydrated seddiment	000 РУБ	585	0	0	0	0	0	0	0	0	0	0	0
Construction of sand sites	000 РУБ	580	0	0	0	0	0	0	0	0	0	0	0
SLS construction	000 РУБ	2 981	0	0	0	0	0	0	0	0	0	0	0
CP construction	000 РУБ	1 340	0	0	0	0	0	0	0	0	0	0	0
Garage construction	000 РУБ	431	0	0	0	0	0	0	0	0	0	0	0
Storage facilities construction	000 РУБ	433	0	0	0	0	0	0	0	0	0	0	0
Transforming substation construction	000 РУБ	2 708	0	0	0	0	0	0	0	0	0	0	0
On-site networks	000 РУБ	6 539	0	0	0	0	0	0	0	0	0	0	0
Off-site networks	000 РУБ	12 731	0	0	0	0	0	0	0	0	0	0	0
Bank outlet construction	000 РУБ	343	0	0	0	0	0	0	0	0	0	0	0
Leveling operation	000 РУБ	1 319	0	0	0	0	0	0	0	0	0	0	0
Arrangeement of pavements and coatings	000 РУБ	5 064	0	0	0	0	0	0	0	0	0	0	0
Planting of greenery on the territory	000 РУБ	1 341	0	0	0	0	0	0	0	0	0	0	0
Small forms	000 РУБ	2 442	0	0	0	0	0	0	0	0	0	0	0
Temporary buildings and constructions	000 РУБ	4 623	0	0	0	0	0	0	0	0	0	0	0
Other works and expenses	000 РУБ	22 887	0	0	0	0	0	0	0	0	0	0	0
Management composition	000 РУБ	3 141	0	0	0	0	0	0	0	0	0	0	0
Project and surveying works	000 РУБ	4 898	0	0	0	0	0	0	0	0	0	0	0
Unforeseen costs	000 РУБ	4 648	0	0	0	0	0	0	0	0	0	0	0
Taxes and obligatory payments	000 РУБ	42 673	0	0	0	0	0	0	0	0	0	0	0
Total		279 744	0	0	0	0	0	0	0	0	0	0	0
Cost savings													
Income increase due to tariff rise	RUR	647 331	1 495 335	2 247 870	2 247 870	2 247 870	2 247 870	2 247 870	2 247 870	2 247 870	2 247 870	2 247 870	2 247 870

Cash flow	000 РУБ	-279 097	-8 415	-7 663	-7 663	-7 663	-7 663	-7 663	-7 663	-7 663	-7 663	-7 663
NPV flow	000 РУБ	-279 097	-7 447	-6 001	-5 311	-4 700	-4 159	-3 681	-3 257	-2 882	-2 551	-2 257	-1 998
NPV total												

5.5 Analysis of the project financial efficiency indices sensitivity

In order to test the sensitivity of the project, we have carried out a cashflow analysis for various scenarios:

- Best case scenario: revenues increased with +10%, operational costs and construction costs decreased with -10%;
- A scenario in which the revenues are increased with +10%;
- A scenario in which the revenues are decreased with -10%;
- A scenario in which the operational costs are increased with +10%;
- A scenario in which the operational costs are decreased with -10%;
- A scenario in which the investment is increased with +10%;
- A scenario in which the investment is decreased with -10%.

The following table summarized the results of the analysis.

Table 5-5 Results of the analysis

Assumption	IRR	NPV	Payback period
Base case scenario	NA	-323 341	NA
Best case scenario	NA	-288 454	NA
Revenues +10%	NA	-322 065	NA
Revenues -10%	NA	-324 618	NA
Operational costs +10%	NA	-328 977	NA
Operational costs -10%	NA	-317 705	NA
Investment + 10%	NA	-351 316	NA
Investment -10%	NA	-295 367	NA

The analysis shows that the proposed project is financially not feasible. This is mainly caused by the revenues being smaller than the Operation & Maintenance costs. A further tariff increase or a decrease in O&M costs is therefore necessary to have a financially feasible project. However, as the economic benefits are likely to be large, the economic feasibility should also be calculated in order to estimate the overall feasibility of the project. Hence, a grant financing percentage might be needed in addition to debt financing.

Special econimic benefits include:

a) Cuts in expenditures of industrial enterprises and community services for water treatment and maintenance of water treatment facilities;
b) Decrease of water organisms contamination by untreated sewage from industrial and community activities:
    a. Improvement of the habitat of water life organisms;
    b. Increase of the general health care level (as a result, cuts in expenditures for health care);
c) Infrastructure development.

5.6 IEP funding

The project realization is not specified in the program for socio-economic development of ZATO Severomorsk because of the high cost. Accordingly, this object was not included in the title list of the capital construction objects in ZATO Severomorsk financed from the federal budget. Therefore, the question of these projects financing that involves federal budget recourses is within the competence of Russian Federation government and can be addressed in state program of Arctic zone of the Russian Federation in the period till 2020.

According to the information provided by the Administration of ZATO Severomorsk the project financing from the regional budget is not expected in the short term. The elaboration of appropriate regional program that will involve financial recourse of the federal budget equity participation is necessary for the implementation of the project.

The local budget of ZATO Severomorsk is subsidized. The involvement of the local budget in the implementation of this project may be in the amount of grants and subsidies allocated by the regional budget to local budget for the arrangements realization of the programs of regional significance. In the existing regional programs, these arrangements are not specified, for the same reason (the high cost of these projects). The works on the design of Wastewater Treatment Plant in the village Severomorsk-3 were done at the expense of local budget resources, the expenses for design account for 3359 thousands rubles.

The participation of MUE “Severomorskvodokanal” enterprise in the shared financing of the projects is possible. The company may allocate the necessary equipment and manpower for an account of expenses for the construction activity in the amount determined by the volume of actual works performed within construction activities. The investment program prepared by the MUE “Severomorskvodokanal” which deals with the wastewater treatment was not included in any regional programs and has died on the vine. Thus, ZATO Severomorsk administration cannot estimate the possibility of financing of these projects from the regional and federal budgets.

It seems logical, given the amount of the investment, to opt for a co-financing mechanism whereby the Russian authorities provide for part of the required funds and one or more international financing institutes for the rest.
Direct funding by Russian authorities can be provided in the frame of federal, regional and departmental targeted programs as well as the federal targeted investment programs.

Federal targeted investment program (FTIP) is the most traditional tool of investment policy which is originated from Soviet time practice of social and economic development. In general, FTIP cad be characterized as a list of projects which are implemented out of funds of federal budget. According to the Russian legislation FTIP funds are the capital government investments into stimulation of social and economic development of the country. However, the FTIP tool can’t be used for this project as the project initiator is unprofitable organization.

The state program "Clean water" is a complex of interrelated package of measures performed by public authorities and local governments, industrial organizations, financial sector, academic institutions, the implementation of which is aimed at reformation and modernization of the water supply and wastewater discharge sector. One of the key elements of the program is the realization of regional and local programs in the water sector (water supply & wastewater discharge sector). The support of the regional programs in the water sector is carried out in the form of target co-financing of regional programs from the federal budget based on the results of competitive selection. More detailed information about the program is available on the website www.gos-water.ru.

As of the time of the estimate the program “Clean water” was in the process of approval and the issue concerning investment securing for the Russian government was still open.

Public-private partnership (PPP) in housing and public utilities covers investment projects on construction (reconstruction, upgrade) of gas-, water-, heat- and energy supply, water discharge, counting and waste water treatment, waste processing and disposal. These projects are being implemented to the benefit of state and branch development with attracting of private funding which can be substantiated by the profits gained by private partner during the project operation and services payment.

There are some examples of projects implemented in the area of waste water supply and discharge in Russia in the framework of public-private partnership (PPP), like GUP “Vodokanal Saint-Petersburg”, Rostov Vodokanal and others. According to the expert’s opinion one of the main conditions of PPP-projects implementation in water supply and discharge is settlement’s population where the project will be implemented (not less than 300 thousands residents). Due to the fact that the population in the settlement Severomorsk - 3 is 3.1 thousands residents, the probability to attract business into the project seems to be very low.

During the project implementation Interviews with representatives of the following organization – potential donors were conducted by the Royal Haskoning project team in August 2009:

- European Bank for Reconstruction and Development
- International Finance Corporation
- EVD (The Agency for International Business and Cooperation: a branch of the Ministry of Economic Affairs of the Netherlands)
- Barents Euro-Arctic Council
- Nordic Environment Finance Corporation (NEFCO)
- Northern Dimension Environmental Partnership (NDEP)
- Coordinator of the target long-term program of Murmansk region “Wastes” - Committee of Nature Use and Environment of Murmansk region and “Environmental protection and hygiene and provision of environmental safety in Murmansk region” – Committee of Nature Use and Environment of Murmansk region

During the initial contact with initiators, the following donors expressed interest to conider the project: EBRD, IFC, NEFCO and NDEP. EBRD has recently signed a framework of cooperation with Murmanskvodokanal indicating a desire of that institution to start supporting this organization. Project summary document as published on the EBRD website is provided in Attachment 3. However, it is advisable for Severomorskvodokanal to focus on IFC, NEFCO and NDEP under the assumption that EBRD does not want to expand its focus by including Severomorskvodokanal in their approach towards Murmansk region.

More detailed information about the organizations expressed their interest is provided below.

5.6.1 European Bank for Reconstruction and Development

Name of funding agency	EBRD
Logo of organization	European Bank for Reconstruction and Development
Name of contact person/ respondent	Mr. Alexander Rogachevsky

Contact details of respondent	St Petersburg Office 25 Nevsky Prospect 191186 St Petersburg Russia Tel. +7 812 703 5540 Fax +7 812 703 5526
Programmatic priorities of funding agency for Murmansk	1. Projects with an environmental component
	2. Water supply
	3. Heating systems
	4. Transport
	5. Solid waste
	Others: for Russian Federation as a whole the priorities are: infrastructure, economic diversification, competitiveness, entrepreneurship, environment and energy efficiency, and regional development. EBRD finances in many sectors, so its focus is rather broad.
Types of funds administered by agency:	1. Long-term financing (10 years)
	2. Equity in private companies
Type of fund relevant for project	Long-term financing
Type of assistance (grant, loan, ….):	Long-term financing, so a loan
Objectives:	- To strengthen institutionally the clients of the bank; - Normal banking objectives, e.g. profit making, however, EBRD is able to invest in more risky projects than that commercial banks would do.
Time frame of current round:	Continuous: there are no rounds, but EBRD looks for opportunities by themselves
Next budget round:	Not applicable
Total value for current round:	About one billion euro for Russian Federation as a whole.
Eligibility criteria/ conditions:	1. Public utilities must be prepared to increase their tariffs 2. Government authorities need to provide a guarantee for the loan 3. Financing amount needs to be higher than 10 million euro
Information materials on fund:	See Russian strategy in annex (in English) See website: www.ebrd.com. For applications: http://www.ebrd.com/apply/index.htm And for Russia: http://www.ebrd.com/country/country/russia/index.htm See also: strategy of EBRD Russia in Russian language

5.6.2 International Finance Corporation

Name of funding agency	**International Finance Corporation (IFC)**

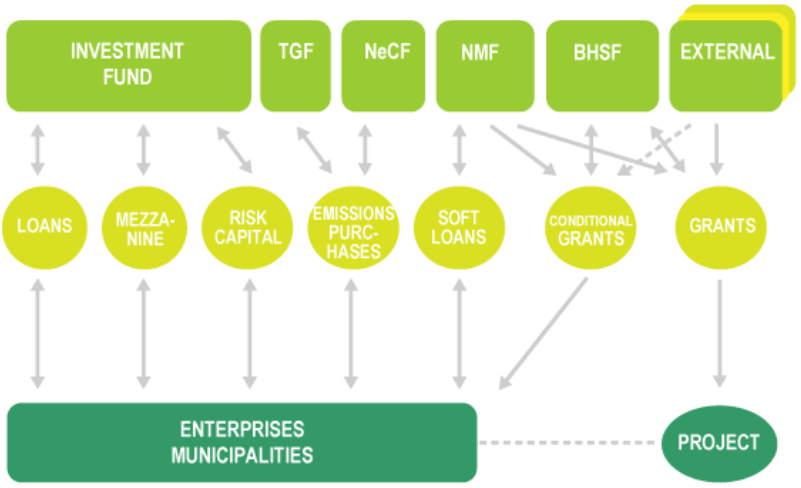
Logo of organization	
Name of contact person/ respondent	Pavel Kochanov
Contact details of respondent	36, bld.1, Bolshaya Molchanovka str., Moscow, 121069, Russia Tel: +7 (495) 411-7555 (ext.2014) Fax: +7 (495) 411-7563 www.ifc.org
Programmatic priorities of funding agency	1. Private sector development, e.g. industry, financial institutes, agriculture
	2. To a lesser extent: public sector support e.g. infrastructure and health
Types of funds administered by agency:	1. Loans
	2. Equity
	3. Intermediate forms between loans and equity
	4. Guarantees
	5. Purchasing of bonds
	Grants only for preparation of programs – technical assistance
Type of assistance (grant, loan, ….):	Long-term financing which is not available through local commercial banks. Conditions are market-rate.
Objectives:	- Promote private business development in private markets; - Invest is public sector development in order to set conditions for further private sector growth
Total value for current round:	Russian Federation: 1 billion USD in 2008. More in 2007.
Eligibility criteria/ conditions:	No formal criteria, but IFC conducts an appraisal of a project, looking at technical, environmental, social, and financial performance. See: http://www.ifc.org/ifcext/about.nsf/Content/Investment_Proposals
Average amount of funding per approved project:	Starting from 200 million Russian Rubles, so 7 – 8 million USD.

5.6.3 Northern Dimension Environmental Partnership (NDEP)

Name of funding agency	Northern Dimension Environmental Partnership (NDEP)
Logo of organization	
Name of contact person/ respondent	Jaakko Henttonen NDEP Manager
Contact details of respondent	EBRD, One Exchange Square London EC2A 2JN Tel. +44-2073387186 Fax +44-2073387486 Mobile +44-7802510609 Email: henttonj@ebrd.com
Programmatic priorities of funding agency	1. Waste water 2. Energy efficiency and heating 3. Solid waste
Types of funds administered by agency:	1. Grants
Type of assistance (grant, loan, ….):	Grants
Objectives:	The purpose of NDEP is to mobilise support for environmental and nuclear safety investments in the Northern Dimension Area by providing grants for concrete projects prepared by the IFIs. The grants are allocated from the NDEP Support Fund which pools significant contributions from partner governments.
Time frame of current round:	Continuous, though decisions of council on project proposals is either in November or December of each year.
Eligibility criteria/ conditions:	The following: 1. Impact on the environment; 2. Geographical location; 3. Co-financing required: they provide 10 – 20 % maximum of a project costs. So other funds to be provided by other agencies through e.g. loan.
Average amount of funding per approved project:	5 million Euro
Information materials on fund:	www.ndep.org and in Russian: http://www.ndep.org/RUS/index.asp For an overview of projects in pipeline: http://www.ndep.org/projects.asp?type=nh&cont=prjh&pageid=15&content=projectlist

5.6.4 Nordic Environment Finance Corporation (NEFCO)

Name of funding agency	Nordic Environment Finance Corporation (NEFCO)
Logo of organization	
Name of contact person/ respondent	Henrik G Forsström, Senior Adviser
Contact details of respondent	Henrik G Forsström Senior Adviser NEFCO P.O. Box 249, FIN-00171 HELSINKI, FINLAND Office: Fabianinkatu 34 Telephone: +358 10 618 0638 Mobile: +358 400 888 541 (Russia +7 952 240 5405) Fax: + 358 9 630 976 E-mail: henrik.forsstrom@nefco.fi http://www.nefco.org
Programmatic priorities of funding agency	1. Water and sewerage
	2. Cleaner technologies in industry
	3. Waste
	4. Renewable Energy & Energy Efficiency
	5. Consultancy & Environmental services
	Others: NEFCO targets all forms of environmentally hazardous emissions and discharges, such as greenhouse gases and toxic pollutant.
Types of funds administered by agency:	1. NEFCO Investment Fund
	2. Nordic Environmental Development Fund (NMF)
	3. Environmental Hotspots in the Barents Region (BHSF)
	4. NEFCO Carbon Funds (TGF & NeCF)
	5. Arctic Council Project Support Instrument (PSI)
	6. Project Specific Funds
	Please note that information on each of these funds can readily be obtained through: *http://www.nefco.org/nefco/financing/*
	NEFCO's funding resources (derived from http://www.nefco.org/introduction/funding_resources):

	
Type of assistance (grant, loan, ….):	NEFCO offers loans, subordinated loans and soft credits to enterprises and municipalities, for projects which aim at reducing environmentally hazardous emissions and discharges, such as greenhouse gases and toxic pollutants, within NEFCO's area of operation (Russia, Ukraine and Belarus, and the Baltic countries). NEFCO administers several funds and facilities that in certain cases can provide grants or other funding (such as carbon financing for JI projects under the Kyoto Protocol) for development and implementation of projects of particular benefit to the environment. NEFCO works within a network of partners including other IFIs, international and national organisations (such as the Arctic Council, Barents Euro-Arctic Council and the NPA-Arctic), bilateral and multilateral donors (including the Nordic governments, the EU and the NDEP). NEFCO may also enter into partnerships with local enterprises which carry out environmental projects in countries where it operates. Each project financed by NEFCO must fulfil certain environmental criteria and the reductions in emissions and discharges must be quantifiable. Each project application is carefully analyzed by NEFCO's legal advisors, investment managers and environmental experts.
Objectives:	The basic mission of NEFCO is to promote cost-effective ways to reduce the environmental pollution emanating from regions adjacent to the Nordic countries.
Average amount of funding per approved project:	N/A - NEFCO works with small and medium-sized projects (sometimes through specialized facilities using intermediaries for smaller projects). NEFCO may provide up to 5 MEUR as an investment in a single project.
Information materials on fund:	Website www.nefco.org where information can be found and downloaded. Contact NEFCO's information department for paper copies and further information.
Contact person for Murmansk region:	Mr Amund Beitnes Investment Manager Telephone: +358 10 618 0658 Mobile: +358 50 311 3684 (Russia +7 921 165 9885)

	Fax: + 358 9 630 976 E-mail: amund.beitnes@nefco.fi
Tips:	NEFCO works within the framework of the Arctic Council and the Barents Euro-Arctic Council (BEAC). The Energy Efficiency Centers in NW Russia have long experience of working with NEFCO.

5.7 Existing sources and conditions of IEP funding

Severomorskvodokanal does currently not have any contract with an international financing agency. Given the fact that the organization is operating at a financial loss, it is not able to handle competitive loan conditions. It therefore seems imperative for a financing agency to combine possible fund provision with an institutional development program, so that the organization will become a financially healthy organization in the investment period.

5.8 Evaluation of demand in additional foreign resources for IEP funding and preferable conditions of their employment

Budget of Severomorsk ZATO is subsidized one, the own budget receipts are 20%, the rest 80% are inter-budget transfers provided by both federal and regional budgets. Therefore participation of municipal authority of Severomorsk ZATO in co-financing these projects will entirely depend on the provided transfers.

In fact, without necessary funds in the budget of Severomorsk ZATO as well in the budget of the municipal enterprise “Severomorskvodokanal”, the project’s implementation is possible only under support of international foreign organizations concerned with protection of marine environment against anthropogenic pollution in the arctic region of the Russian Federation. Besides, this object is non-profit one, since the operation costs should be included to fresh water rates. The fresh water rates as well as sewage treatment rates are stated by decision of municipal authorities of Severomorsk ZATO.

6 CONCLUSIONS

6.1 Brief conclusions

This project resolves the problem of sewage treatment in the Severomorsk-3 settlement, which are so far discharged to the river Srednyaya without being treated, hence making the environmental and sanitary and epidemiological situation tense.

The project is going to be implemented by MUP "Severomorskvodokanal". MUP "Severomorskvodokanal" fulfills the main task – water supply and water discharge of Severomorsk, settlements of Roslyakovo, Roslyakovo – 1, Safonovo, Safonovo-1, Kortik, Schuk Lake, Severomorsk-3.

The enterprise consists of pump station service sites, water supply and sewage systems. There are 13 outlets for wastewater discharge, among which 11 discharge to the Kola Gulf, 1 outlet discharges into the Gryaznaya River through mechanical treatment plants, and 1 outlet discharges to the Srednyaya River.

As of today Municipal Unitary Enterprise «Severomorskvodokanal» is detrimental which is indicated in Consolidated budget of fixed assets movements for the period of 2004-2008.

Due to the housing development and capital repair of old housing stock in Severomorsk-3 settlement the level of redevelopment has increased. In such conditions the only construction of sewage treatment facilities in Severomorsk-3 settlement will generally provide normal operation of disposal facilities and accordingly improve the environmental and sanitary and epidemiological situation.

Based on SNiP 2.04.03-85, together with practical experience gained for number of years in communal sphere, input data about the settlement type, uniformity of coming sewage, quality of the coming waters and quality of the treatment, conditions of the water discharge etc. Biological method of treatment has been selected for the project as the most technically and economically justified.

The project implementation will allow:

- to decrease the content of pollutants in the discharges sewage water on average 4 times related to suspended substances, 4 times related to BOD, 7 times related to oil products, 7 times related to nitrites, 2.5 times related to phosphates;
- to improve the sanitary state of the water body, quality of water both in the river itself and in the system of lakes through which it flows, and in the Kola Bay;
- to improve the conditions for the reproduction of biological resources in these water bodies;
- The accepted technology of sewage water treatment with the pre-denitrification and deep nitrification provides the decrease of biogenous elements content in the sewage to the MPC (Maximum Permissible Concentration) for the fishery water bodies.

As for soicial consequences, the realization of the project will

- Increase environmental safety of the population residing near the river;
- Provide working places for a part of the population of Severomorsk ZATO (altogether 32 working places are planned).

The analysis shows that the proposed project is financially not feasible. This is mainly caused by the revenues being smaller than the Operation & Maintenance costs. A further tariff increase or a decrease in O&M costs is therefore necessary to have a financially feasible project. However, as the economic benefits are likely to be large, the economic feasibility should also be calculated in order to estimate the overall feasibility of the project. Hence, a grant financing percentage might be needed in addition to debt financing.

Special econimic benefits include:

a) Cuts in expenditures of industrial enterprises and community services for water treatment and maintenance of water treatment facilities;
b) Decrease of water organisms contamination by untreated sewage from industrial and community activities:
    a. Improvement of the habitat of water life organisms;
    b. Increase of the general health care level (as a result, cuts in expenditures for health care);
c) Infrastructure development.

This IEP can be replicated within the region considering the fact that the sewage water treatment problem is one of the most critical for Murmansk Region.

6.2 Major risks and uncertainties in connection with IEP implementation

The following key risks have been detected when examining the project:

Technological

From the technological point of view the project is enforceable provided that the project is implemented by the experienced contractors.

However, since similar projects have not been realized at the Kola region yet, some problems concerning disposal of produced dry sediments can arise. There are no specialized disposal sites for such sediments in Kola, which meet all the environmental requirements for solid waste disposal sites. Methods for the further disposal or recycling of sediments should be determined based on the results of the chemical analysis.

Environmental

This project is aimed at improvement of the existing environmental situation. Provided that all scheduled preventive measures are implemented, the level of influence is estimated as acceptable.

Social

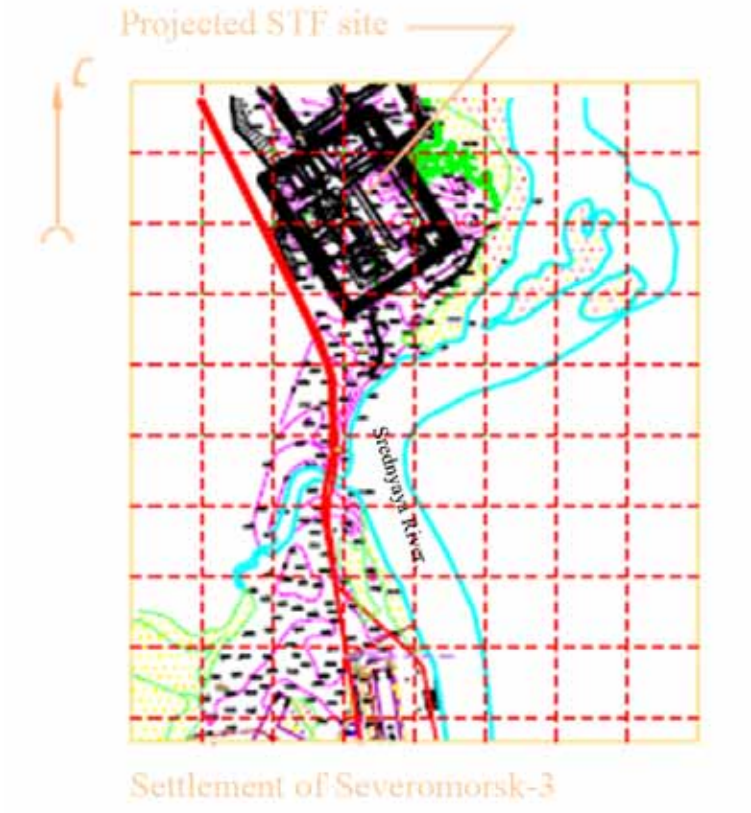
The offered investment project involves improvement of the social sphere through creation of additional workplaces and improvement of the living environment of the local population.

Financial

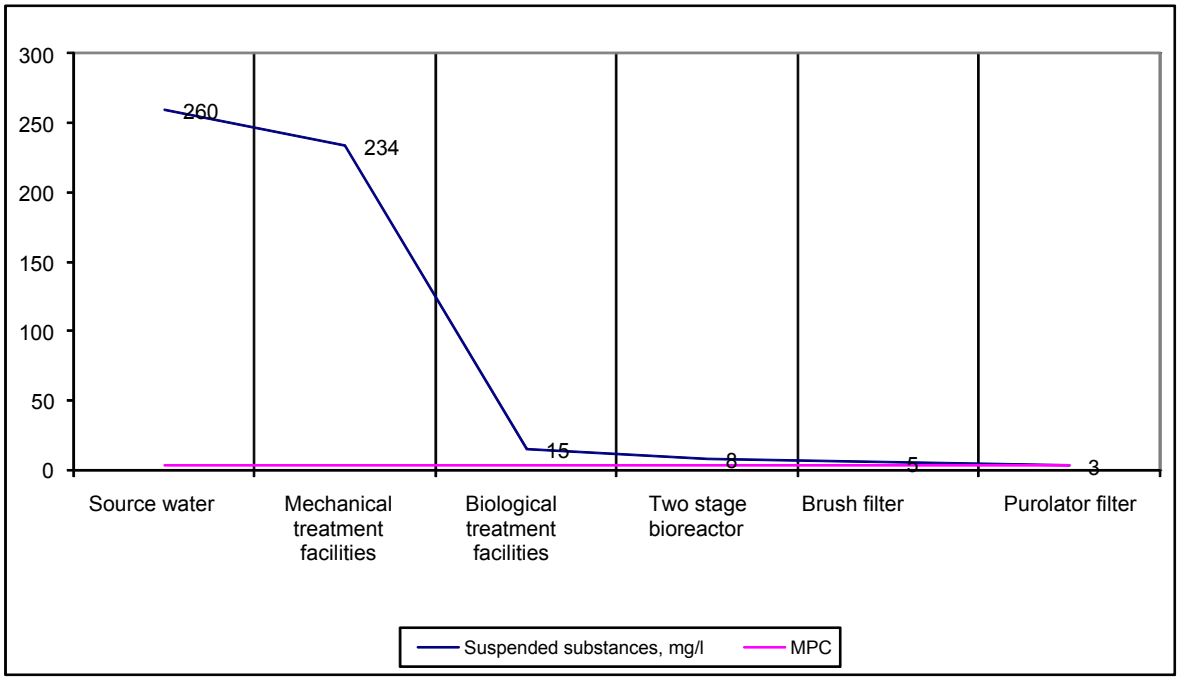
The key financial risk is underfinancing, increase in costs of servicing and operation, insufficient quantity of consumers.

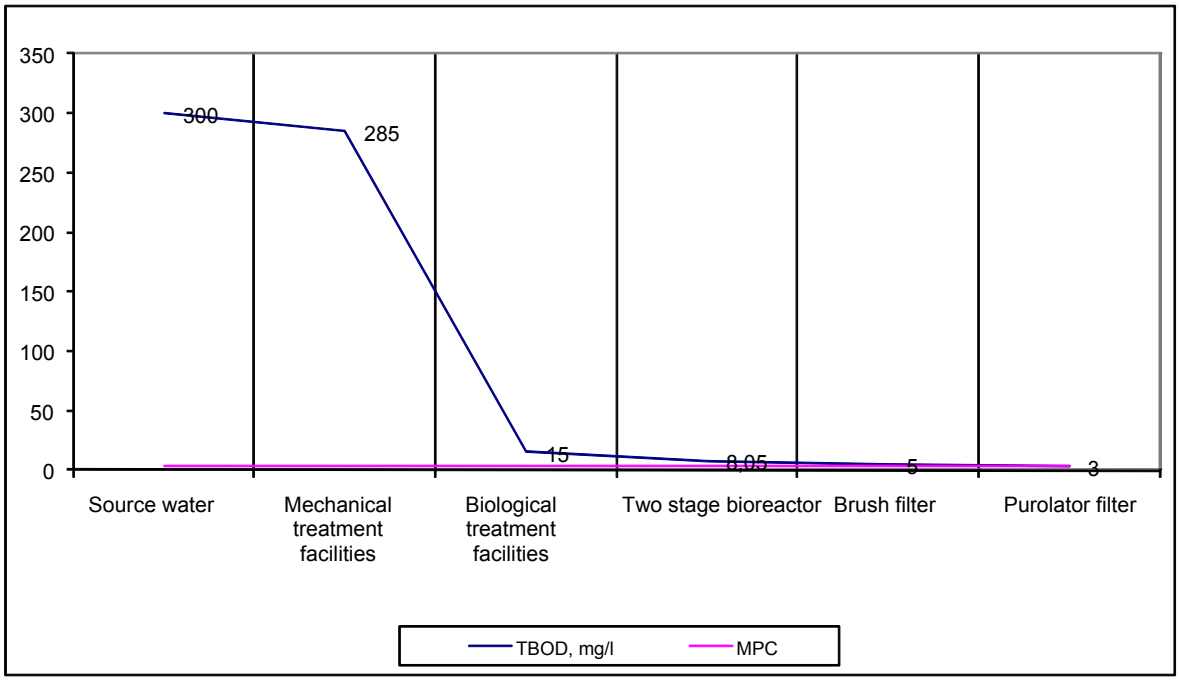
One of the measures directed to reducing such risk can be involvement of outside financial institutions in the project so as to receive a grant and/or a credit.

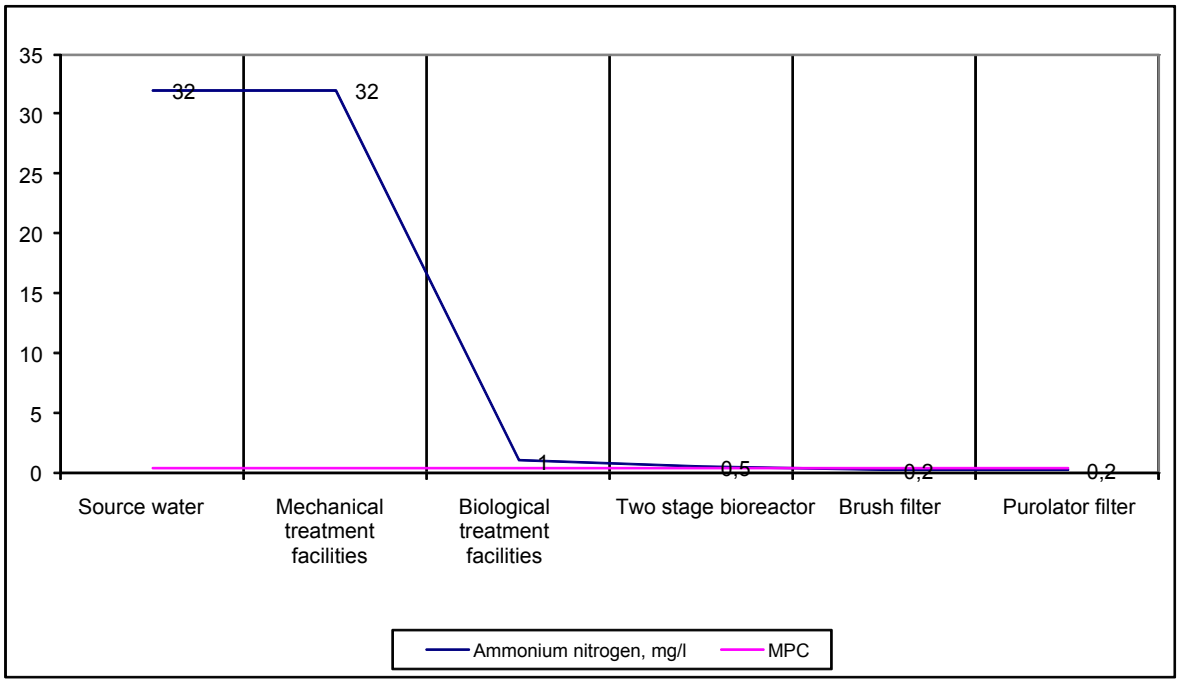
Appendix 1. General Layout of the Site



Appendix 2. Change in Pollution Concentration by Treatment Steps



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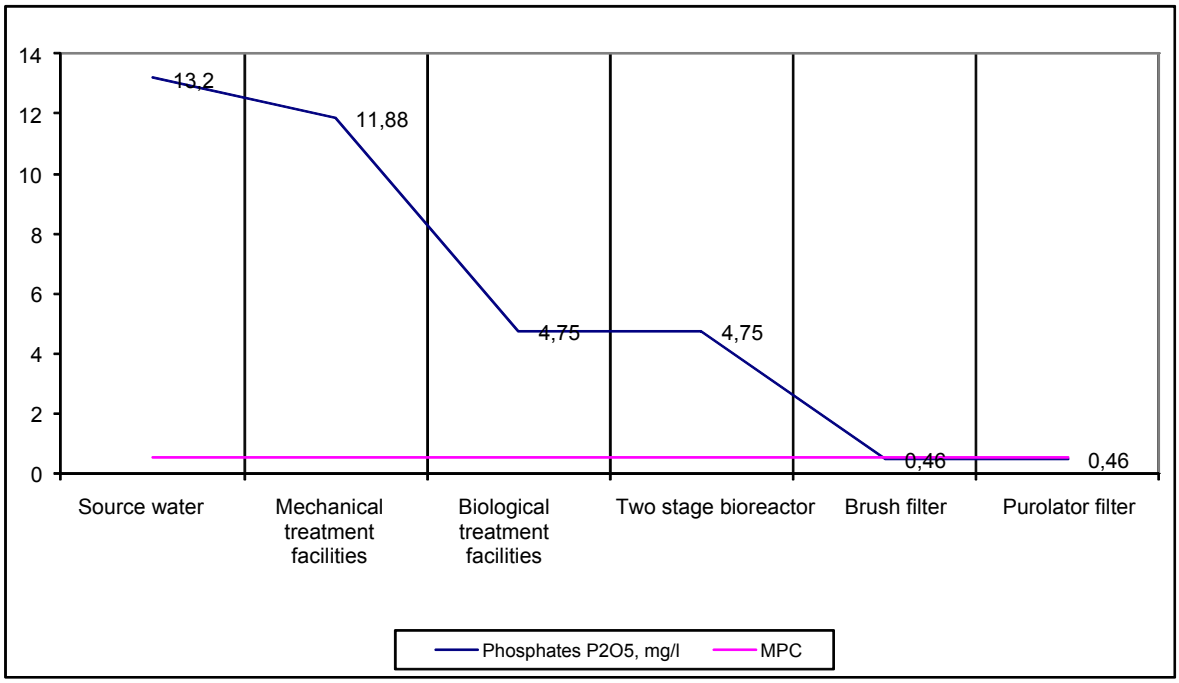
Source water
Mechanical treatment facilities
Biological treatment facilities
Two stage bioreactor
Brush filter
Purolator filter
Ammonium nitrogen, mg/l
MPC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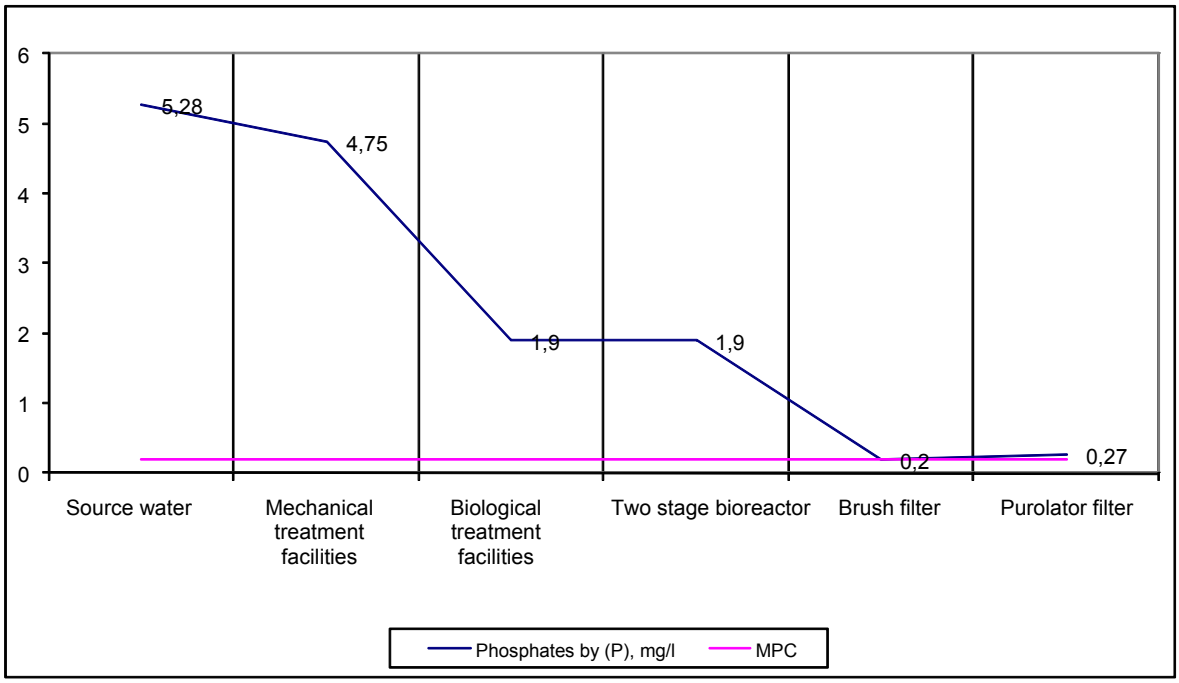
Mechanical treatment facilities
Biological treatment facilities
Two stage bioreactor
Brush filter
Purolator filter
Phosphates P2O5, mg/l
MPC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0,27
Source water
Mechanical treatment facilities
Biological treatment facilities
Two stage bioreactor
Brush filter
Purolator filter
Phosphates by (P), mg/l
MPC

Appendix 3. MUE Murmanskvodokanal project

Project Summary
(source – EBRD website http://www.ebrd.com/projects/psd/psd2009/40856.htm)

Project name:	Murmansk Water Improvement Program
Country:	Russia
Project number:	40856
Business sector:	Municipal and environmental infrastructure
Public/Private:	Public
Environmental category:	B
Board date:	1 September 2010
Status:	Passed concept review, Pending final review
Date PSD disclosed: **Date PSD updated:**	20 October 2009
Project description and objectives:	The EBRD is considering financing construction, rehabilitation, upgrade of water supply and wastewater infrastructure in the City of Murmansk within the Murmansk Oblast. The priority investments to be financed by EBRD will be defined by consultants in a feasibility study.
Transition impact:	Transition impact is expected to be achieved through: • Introduction of transition related performance indicators, to be identified during due diligence; • Skills and knowledge transfer during the Corporate Development Support Programme and training for the Project Implementation Unit; • Cost restructuring (demonstration effect), the project will assist the client in its effort to control its costs, including through reduction in operating and maintenance costs and a decline in water and energy losses; • Introduction of a service agreement to further commercialise the operations of the Company; • Tariff reform (improved methodology). The new tariff methodology will be adopted to ensure full cost recovery tariffs including investment costs and possibly a shift to multi-year tariff setting. • Providing an economic rate of return to

	ensure prudent use of public funds (municipal guarantee) • Corporatisation of the water utilities in order to improve the service provision and improving financial performance. Development and implementation of an Environmental and Social Action Plan (ESAP) which will significantly improve the Company's environmental management and overall performance.
The client:	"Murmanskvodokanal" MUE (the "Company"), a company providing water and wastewater services to both residential and industrial customers in the City of Murmansk and 7 neighbouring settlements and wholly owned by the Murmansk Oblast
EBRD finance:	Senior corporate loan to the Company of up to RUB 650 million (equivalent of around EUR 14.5 million), guaranteed by the Murmansk Oblast.
Total project cost:	Up to RUB 1 090 million