JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 01 - in effect as of: June 15, 2006

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

Development and improvement of water supply system, drainage system and wastewater treatment of «Infox Ltd.» branch «Infoxvodokanal»

Sectoral Scopes:

1. Sectoral scope 3 – "Energy demand".

The version number of the document: 03
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A.2. Description of the project:

Purposes of project activity: The project's main goal is reduction of electric energy consumption by modernization and development of centralized water supply, drainage and wastewater treatment systems, which includes replacement and modernization of pumps and water distribution systems, installation of frequency regulators, optimization of the technological process of water pumping and wastewater treatment system (aeration system in aerotanks) in the city of Odesa. Implementation of the abovementioned technologies will allow for decrease of greenhouse gas emissions (CO_2). The project mission is to promote sustainable development of the city.

Historical details of "Infoxvodokanal"development. Since 1794, the absence of a reliable and high quality supply of water has been a problem that hampered the development of city's infrastructure. It was only in 1873 that a water pipe with water treatment facilities was activated in the village of Bilyaevka, producing 20 thousand m^3/day. Dominikon and Golovachev, both engineers, developed technical design of the conduit "Dniester-Odesa" in the 60s of the XIX century and it was approved by a special commission in 1870. This project was implemented by the "Shvaber and Moor" Moscow's firm. Dnister water was one of the cleanest in Europe in terms of its qualities even at that time. The first modernization of the "Dnister" plant took place almost 30 years after its opening. An electric pump was installed in addition to the steam one, and one more water pipe was built as one water pipe was not enough. The main innovation was the construction of so-called slow filters - pools, covering about 4 thousand square meters, which the layer of gravel and sand at the bottom. After these filters, the water was very clean and did not require decontamination. The "Dnister" plant got new filters, pumps and another water pipe in 1939. Post-war Odesa was developing. New residential areas started to appear. Miles of water supply and drainage pipes were being built. The procedure of water treatment changed. Despite their effectiveness the system of slow filters had several disadvantages - the pools were covered with ice crust in winter and removal of contaminated top layer turned into labour-consuming procedure in summer. Therefore, a new water treatment system was built in the 70s. Methane tanks were built at "Pivnichna" wastewater treatment plant in the 80's. By the decision of Odesa city council # 2038-XXIV, the full property complex of CE (Communal Enterprise) "Odesvodokanal" was rented out to "Infox" Limited liability company for the period of 49 years. This took place on December 17, 2003. "Infoxvodokanal" has been performing water resource management services in the Odesa region since January 1, 2004. «Infoxvodokanal» consists of 10 structural subdivisions, where more than 3000 people work. This branch services 1657.7 km of water pipes and a drainage network of 680.2 km in length. The wastewaters are treated at two biological treatment plants ("Pivnichna" and "Pivdenna"). Today, the company supplies water to Odesa as well as populated communities within a 50 km radius from the region's center. The company owns seven water lines, the first of which was laid in 1873. Construction of the last one stopped in 1989, but was re-started

in 2004 after a private investor got involved. Consumers have been receiving water 24 hours a day since 2004. The main source of water is the Dnister river. Water intake and cleaning of the surface of water takes place at the "Dnister" water treatment plant, located in the town of Bilyaevka, 40 km away from Odesa. Useful productivity of the "Dnister" water treatment plant is 920 thousand m^3/day, while the actual water supply is 480-550 thousand m^3/day. The Dnister river is the only source of water for the Southern part of Odesa region, which includes such towns as Ilyichivsk, B. Dnistrovskyy, Bilyaevka, Ovidiopol, Teplodar, and Yuzhnyi.
The management of «Infox Ltd.» branch «Infoxvodokanal» made a decision to implement the JI project at the enterprise during a board meeting on December 17, 2003.
December 17, 2003 is a commencement date of elaboration of joint implementation project design documentation.

The subject of core activities of "Infoxvodokanal" at this time are the following:

1. Centralized water supply, drainage as well as wastewater treatment;
2. Operation of external water supply system, drainage system as well as water and wastewater treatment;
3. Development of operating conditions and technological parameters of the water supply system and drainage system;
4. Development and provision businesses and individuals (customers) with technical specifications for water supply and drainage of architectural projects;
5. The construction and operation of production facilities with water intake and water treatment, wastewater treatment and pumping;
6. The construction and operation of water-supply and drainage pipelines;
7. Design, fabrication, installation, operation, maintenance of gauge sites, production, repair, testing, verification and certification of water meters;
8. Acquisition, use in production of chlorine and other reagents (UV lamps, sodium hypochlorite) for disinfection of water, the construction and operation of facilities for their storage and use.

Description of conditions whereon the project will be implemented.
The "Infoxvodokanal" branch is one of Ukrainian companies with typical water supply, drainage and wastewater treatment systems that are usually operated in an unsatisfactory technical state thereof. Continuous wearing out of equipment, old technological schemes, lack of facilities and water supply systems modernization, lack of new technologies implementation result in the following:

- ineffective and excessive electric energy consumption;
- ineffective wastewater treatment.

In case of absence of the Joint Implementation (JI) Project amount of consumed electric energy as well as fossil fuel for water and wastewater transportation, treatment of wastewater would increase (due to moral depreciation and technical wearing out of the equipment).

The baseline scenario is "business as usual" scenario providing for implementation of minimal repair against the background of total degradation of the technical condition of water supply system, drainage system and wastewater treatment. There are no barriers for implementation of this Baseline scenario (there are no investment barriers as this scenario doesn't require additional investment; there are no technological barriers as this equipment is operated by skilled personnel and there is no need to additionally retrain the personnel). This scenario reflects customary practice in Ukraine.

The project provides for GHG emission reduction due to:

- Modernization of pump equipment;
- Replacement of pump equipment;
- Optimization of the technological process of water pumping;
- Installation of automatic air valves;
- Replacement of shut-off and control valves;
- Replacement of water-supply and drainage networks;
- Installation of new groups of metering devices;
- Installation of frequency regulators;
- Modernization of aeration system at treatment facilities (aerotanks);
- Implementation of a small hydroelectric power plant.

Due to reduction of consumed electric energy from electrical grid of Ukraine used by pumping plants, burning of fossil fuel for electric energy generation to the network will be decreased.
Due to the free flow of water at turbines installed, which takes place during discharge of treated wastewater after the wastewater treatment facilities, the transformation of kinetic energy of water into electric energy will take place. The electric energy will be used for the company's own purposes and this will result in reduced use of electric energy from the national grid of Ukraine.
This will be implemented after the project implementation, when servicing in the sphere of water supply becomes more effective.

*The project may promote sustainable development of "*Infoxvodokanal.*" in the following aspects:*

- Decrease of national economy's dependence on import of energy and increase of country's energy security;
- Improvement in quality of water supply and water treatment at discharge in waters;
- High rates of labor and health protection;
- Improvement of the global ecology state (counteraction in response to global climate change by means of reduction of greenhouse gases (GHG) emission into the atmosphere);
- Solution to the problem of continuous water supply to consumers and drainage of wastewater.

A.3. Project participants:

Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (YES/NO)
Ukraine (Host Party)	• «Infox Ltd.» branch Infoxvodokanal»	No
Switzerland	• "VEMA S.A."	No

A.4. Technical description of the project:

A.4.1. Location of the project:

The Project is located in the city of Odesa (Figure 1.).

Figure 1. Location of "Infox Ltd." branch "Infoxvodokanal" on the map of Ukraine

A.4.1.1. Host Party(ies):

The project is located in Ukraine.
Ukraine is an Eastern European country that ratified the Kyoto Protocol to the UN Framework Convention on Climate Change (UN FCCC) on February 4, 2004, and is listed in the Addition 1 to the UN FCCC and is eligible for the Joint Implementation projects.

A.4.1.2. Region/State/Province etc.:

Odesa Region is a region (province) in the South of Ukraine. The region borders with Vinnytsia and Kirovograd region in the North, Mykolayiv region in the East, Moldova and Trans-Dniester breakaway territory in the West, Romania in the South-West. Most of the Odesa region is situated in the Black Sea Lowland and it gradually positions down to the Black Sea. River network of Odesa region belongs to the Black Sea area as well as the basins of the Dnister river and the Southern Bug river. The main rivers are: the Danube river, the Dnister river, the Kodyma river and the Savranka river. There are many freshwater lakes (Cahul, Yalpug, Katlabuh) and saline lakes (Sasyk, Shahany, Alibey, Burnas) at the coastal zone. There is also a large number of estuaries (the largest ones are Dnistrovskyy, Kuialnytskyy and Hadzhybeyskyy) on the coast.

A.4.1.3. City/Town/Community etc.:

Odesa is a city of regional subordination in Ukraine, the administrative center of Odesa region. As of 2010 population of Odesa amounted to 1 005 591 people. Odesa is a city on the Black Sea coast of Ukraine, an administrative center, the largest port of Ukraine, a large industrial, cultural, scientific and recreation center; highway and railway node. Odesa's area is about 236.9 km². Coordinates are 46 ° 28'18" NL, 30 ° 42'37" EL.

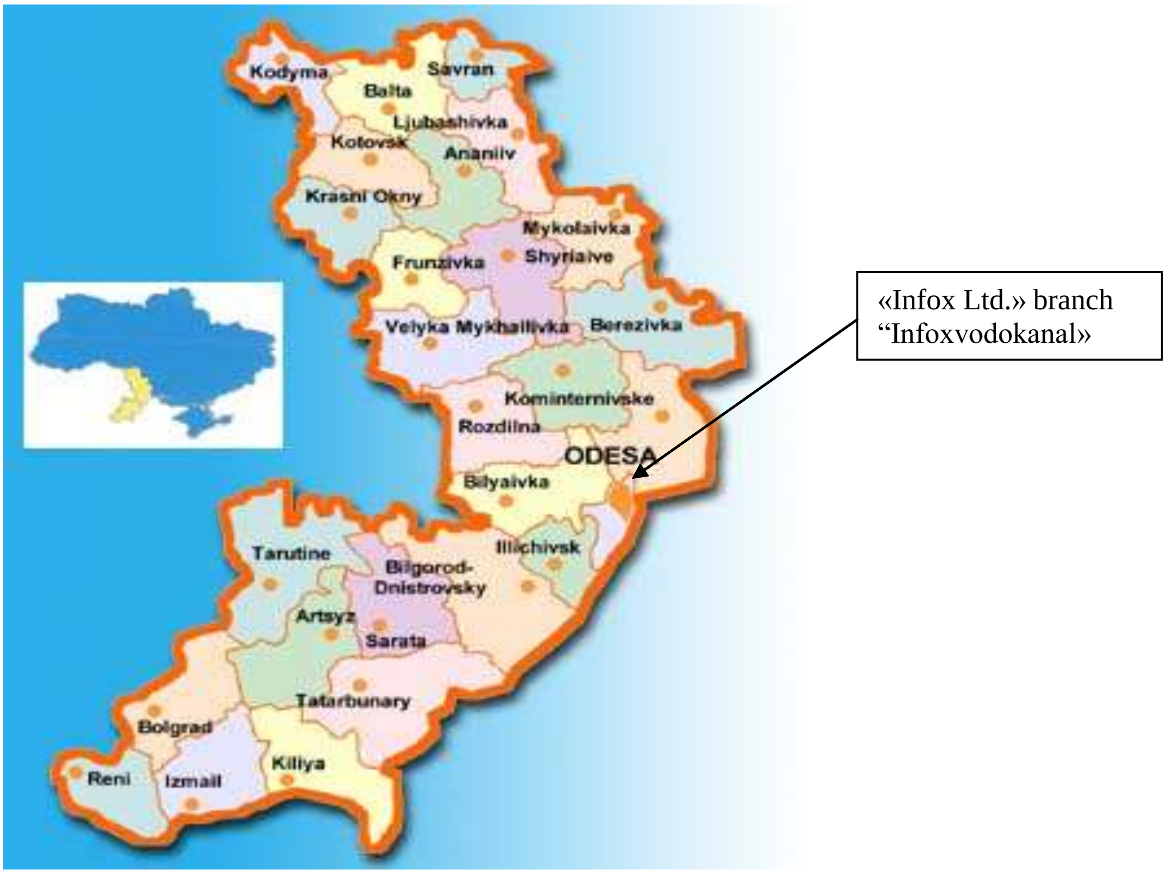

Figure. 2. The map of Odesa region

A.4.1.4. Detail of physical location, including information allowing the unique identification of the project (maximum one page):

Subdivisions «Infox Ltd.» branch «Infoxvodokanal»:

1. Management of branch "Infoxvodokanal;
2. Miskvodoprovid (Municipal water supply system);
3. Miskkanalizatsiya (Mumicipal drainage);
4. "Dnister" water intake treatment plant;
5. “Pivnichna” biological treatment plant;
6. “Pivdenna” biological treatment plant;
7. Monitoring of the water consumption service;
8. Water discharge service;
9. Spetsavtohospodarstvo (Special auto enterprise);
10. Central repair shops.

Table 1. Facilities involved in the project

Pumping plants	Location
"Dnister" water intake treatment plant	
NS 3I lift	Bilyaivka, 406 Lenina Str, Odesa region
NS 4I lift	Bilyaivka, 406 Lenina Str, Odesa region
NS 5I lift	Bilyaivka, 406 Lenina Str, Odesa region
NS 2II lift	Bilyaivka406 Lenina Str, Odesa region
NS 3II lift	Bilyaivka, 406 Lenina Str, Odesa region
NS 4II lift	Bilyaivka, 406 Lenina Str, Odesa region
NS 5II lift	Bilyaivka, 406 Lenina Str, Odesa region
NS 6II lift	Bilyaivka, 406 Lenina Str, Odesa region
«Miskvodoprovid» (Water supply pumping plants)	
"Glavnaya" Plant	Odesa, 15 Vodoprovidna Str.
"Yuzhnaya" Plant	Odesa, 92 Gastello Str.
"Kotovskogo" Plant	Odesa, 3 Shevchenko Pos.
"Zapadnaya" Plant	Odesa, 203 Agronomichna Str.
"Shkodogorka" Plant	Odesa, 9a Motorna Str.
"Stolbovaya" Plant	Odesa, 1 Stolbova Str.
"Zhevahova Gora" Plant	Odesa, 8 Bereznya Str.
«Miskkanalizatsiya" (Drainage pumping plant)	
KNS "Glavnaya"	Odesa, 15 Nalyvna Str.
KNS №2	Odesa, 3 Chornomorska Road
KNS №4A	Odesa, 13 Central airport
KNS №6	Odesa, 16 plant of a big fountain, Zolotyy berig Str.
KNS №6A	Odesa, 29 Lvivska Str.
KNS №6B	Odesa, 1 Almaznyy Prov.
KNS №7	Odesa, 21 Chervonyh zir Str.
KNS №8	Odesa, Arkadiya
KNS №9	Odesa, 26 Syoma Peresyptska Str.
KNS №10	Odesa, 259 Mykolayivska Road
KNS №10A	Odesa, Naklinna Str.
KNS №11	Odesa, 24 Baltska doroga Str.
KNS №12	Odesa, 135 Tolbuhina Str.
KNS №12A	Odesa, 24 I. Razina Str.
KNS №13	Odesa, 49 Malynovskogo Str.
KNS №15	Odesa, 20 Profsoyuzna Str.
KNS №16	Odesa, Krasnova Str.
KNS №17A	Odesa, 2 Breusa Str.
KNS №22	Odesa, Botanichnyy Prov.
KNS – «Vuzovskiy»	Odesa, 46, a Shyshkina Str.
KNS «Obuvnaya»	Odesa, 115 Amultsena Str.
KNS sel. Shevchenko	Shevchenko village – 3, 43 line, Odesa region
KNS shkola 125	Odesa, 1 Kruglova Str.
KNS shkola 130	Odesa, 56 Obnorskogo Str.
KNS -25	Odesa, 70 Baltska doroga Str.
Wastewater biological treatment plants	
"Pivnichna" biological treatment plant	Odesa, Khadzhybeyivska Road, 32
"Pivdenna" biological treatment plant	Odesa, D. Kovalevskogo, 146
Small hydroelectrical power plant	
MGES (Small hydroelectrical power plant)	Odesa, "Pivdenna" biological treatment plant

A.4.2. Technology(ies) to be employed, or measures, operations or actions to be implemented by the project:

Measures to be implemented in order to increase the efficiency of water supply at «Infox Ltd.» branch "Infoxvodokanal" are the following:

1. Modernization of pumping equipment

Branch "Infoxvodokanal" uses horizontal and submerged pumps. A submerged pump is the pump submerged below the level of pumped over fluid. This ensures deep water lifting, quality cooling of pump components and enables to lift the water with dissolved gas. Horizontal pumps are aimed at pumping over of fresh water with the temperature of +100°C and are used to supply water to urban settlements and industrial companies. The project provides for replacement of stuffing boxes that prevent water leakage from pumps which leads to improvement of pump operation and it also provides for cutting of pump rotor. Exit edge of rotor is grinded off along the length, thus increasing output area of rotor channels in a circumferential direction. Conducted experiments demonstrated that increase of output area by 11.7% enables to increase feed by 16.7% on condition of the highest value of Efficiency Factor and invariable power and head. Such types of pumps as 1D-1250-63a, 22NDS, 24NDSV, 5NDV, 8NDV, 20NDS, 14D-6, 350A-90A, 4NDV will be modernized. Technical characteristics of pumps that would be modernized under the project implementation are given in the *Table 2.*

Table 2. Technical characteristics of pumps

Nominal size of pump unit	Q, m^3/h	H, m	Nd, kW
1D-1250-63a	740	24	70
22 NDS	3600	52	630
24NDSV	5200	50	860
5NDV	250	31	55
8NDV	600	55	110
20NDS	3420	71	800
350A-90A	1200	25	160
14D-6	1250	125	630
4NDV	180	95	75

Figure 3. Horizontal double-entry pump of 1D-1250-63a type

Figure 4. Horizontal pump of 22NDS type

2. Replacement of pumping equipment

Old pumps with low efficiency will be replaced by the pumps with the efficiency of 81-89%. Technical characteristics of new pumps to be installed are stated in the *Table 3*:

Table 3. Pumps of WILO CST / SCP HA / SCP DV type with electric motors of general industrial application

Nominal size of pump unit	Q, m^3/h	H, m	Nd, kW
WILO CST-400/450	2800	77	630
WILO SCPP 400/690 HA	3000	72	630
WILO SCPP 250/390 HA	1280	51	250
WILO SCPP 400/710 HA	3000	72	630
WILO SCPP 400/660 DV	3400	140	630

Figure 5. Centrifugal pump of WILO CST / SCP HA / SCP DV type

Table 4. Pumps of WILO VeroNorm NPG type with electric motors of general industrial application

Nominal size of pump unit	Q, m^3/h	H, m	Nd, kWt
WILO VeroNorm NPG 400/650	2700	65	400
WILO VeroNorm NPG 250/500	1100	90	630
WILO VeroNorm NPG 250/315	1000	27	315
WILO VeroNorm NPG 65/315	160	140	90

Figure 6. Centrifugal pump of WILO VeroNorm NPG type

3. Optimization of the technological process of water pumping

Optimization of the technological process of water pumping will be conducted in such a way that at some areas the water will be supplied directly to the consumers, bypassing the reservoirs. There will be transfer of load from pumping plants with old equipment to the pumping plants fitted with high-efficiency equipment. Id est improvement of hydraulic circuit of water supply with disconnecting of pumps takes place.

In the process of pumping, the energy is consumed to surmount gravity forces and friction of the liquid. Thus, the savings will be attained due to achieving proportionality of the pumps operation under the minimum requirements (pressure and flow rate of liquid).

4. Installation of automatic air valves

Automatic air valves produced by Hawle[1] company will be implemented to achieve decrease in pressure in water mains and improvement of waterway capacity. This type of safety relief valves will allow for regulation of pipe pressure drops due to automatic air relief from water and wastewater pipes. They are usually installed at the highest points of a pipe line. Automatic air valves are devices of float-valve type (the so-called air valves). In the body thereof, there usually is a float, connected by swivel arm with a venting valve. Internal volume of air vent is designed so that in the absence of air the float keeps the venting valve closed. With the accumulation of air in the float chamber (pipe) the float falls, opening the

[1] *http://6600577.ru/hawle/eliminators*

venting valve. After venting the float rises again, acting on a lever, closing the venting valve. Air vents are supplied with screw locking caps to prevent leakage of water in case of breakage.
Due to the installation of automatic air valves the risk of hydraulic shock disappears, the operational life of pipelines increases and the risk of failure in the networks decreases. This in turn will ensure reduction of water losses in pipelines. Figure 7 shows an example of automatic air valves for a pipeline with diameter of 200 mm.

Figure 7. Automatic air valve DN = 200 mm produced by Hawle company

5. **Replacement of Shut-off and control valves**

Shut-off and control valves are a key element of all technological systems based on the use of any carrier (pure water, wastewater) because they allow you to adjust the flow thereof. This is a physical control device of pipeline systems. The main functions of valves – connection of devices and pipes, prevention and control over work flow of carrier: shut-off, balance, regulation of flow pressure. It is planned to replace obsolete shut-off and control valves of the USSR production with the shut-off and control valves of European manufacturers under the project. *Table 5* shows characteristics of high-efficiency shut-off and control valves that would greatly improve the level of energy efficiency of water supply and drainage systems (5-10% efficiency compared to the old equipment).

Table *5. Characteristic of typical Shut-off and control valves to be implemented.*[2]

Nominal size of Shut-off and control valves	Diameter, mm	Length, mm	Height, mm	Weight, kg	Material
Hawle E2 D600	600	350	720	490	Malleable cast iron EN-GJS-400-18
Hawle DN200	200	230	679	41	Ductile iron GGG400
Hawle DN 50-400	50-400	125-512	349-1353	13-184	Grey iron EN-GJL -250

[2] *http://www.havvle.ru/index.php*

Figure 8. Wedge seated gate valve with smooth straight-through bore Hawle E2 D600

Figure 9. Resilient seated gate valve with smooth straight-through bore Hawle DN200

Figure 10. Slide seated gate valve with non-rising spindle and with adapter for installment of electric drive of Hawle DN 50 – 400 type

In addition to the above mentioned examples of shut-off and control valves, other models of valves of this as well as other manufactures shall be installed.

6. Replacement of water-supply and drainage networks

Replacement of water supply and drainage networks provides for replacement of obsolete pipes with new high-efficiency[3] ones. Technically worn out pipes will be replaced by fiberglass[4] and plastic[5] pipes that are characterized by durability (over 50 years), effectiveness in operation and corrosion resistance.
Modernization of water supply and drainage systems will enable decrease of electric energy loss due to full use of water, change of pressure within the network enabling the pumps to operate in optimal regime.

Figure 11. Fiberglass pipes FLOWTITE

"Infox Ltd." branch "Infoxvodokanal" makes annual estimates of water losses in the network. Based on these calculations, the company determines planned replacement. If the loss of water in the area does not exceed the standard water loss, the company is not obliged to carry out scheduled replacement of pipeline. Pipelines to be replaced as a result of the project implementation are not a part of maintenance (emergency situations, scheduled replacement). Replacement of pipelines occurs in areas that have not exceeded the projected loss of water, but are in poor condition.

7. Installation of new group of metering devices

New group of metering devices will be installed for ordering of control and metering of water and electric energy consumption.

Table 6. Characteristic of metering devices

Metering device type	Accuracy	Calibration interval	Deadline for verification	Purpose
DM23574, KSD-054	1.5	1 year	2010	Water flowmeter

[3] http://www.infox.ua/projects/fiberglasspipes/

4 http://www.metallprofil.avcom.in.ua/vodoprovod/flowtite.html

[5] http://www.aquatherm.ua/main_ua/products/

SL-761 CO 71	0.5	6 years	2008	Electric energy meter
F68700V	1.5	4 years	2007	Electric energy meter

8. Installation of frequency regulators

Installation of frequency regulation of electric motors of water supplying pumps will enable to decrease electric energy consumption significantly. Such equipment will enable to regulate power of electric motors depending on connected load both within twenty-four-hours of water supply change and within a year. That is, regulation of electric energy and water consumption would greatly change the overall picture of water-power dependence. Precise data regarding overall improvement of efficiency of water supply, drainage systems will be presented after the monitoring process.

Table 7. Characteristics of frequency regulators

Type of frequency regulator	Power, kW	Producer
L300P-5500HF	132	Hitachi
MDA-A-220L-2-55, VAT2000	55	General Electric
MDA-A-550L-2-132, VAT2000	132	General Electric
MDA-A-440L-2-110, VAT2000	110	General Electric
MDA-A-300L-2-75, VAT2000	75	General Electric
MDA-A-120L-2-30, VAT2000	30	General Electric
MDA-A-60L-2-15, VAT2000	15	General Electric
ACS 550-01-124A-4	40	ABB
ACS 550-01-131A-4	15	ABB
ACS 550-01-072A-4	37	ABB
ACS 550-01-059A-4	30	ABB
FC 202 Aqua drive	450	Danfoss

9. Modernization of aeration system at treatment plants (aerotanks).

Modern wastewater treatment plants carry out the phase of biological treatment in order to defecate the water from mineral and organic contaminating agents, which are in elevated, colloidal and dissolved state. Technological scheme of treatment plants is shown below (Figure 12).

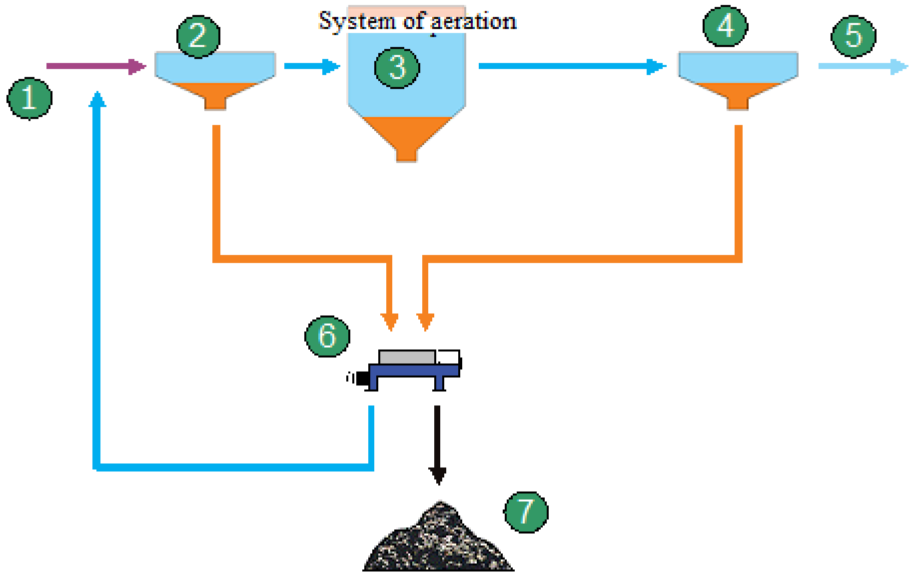

Figure 12. Technological scheme of "Pivnichna" and "Pivdenna" treatment plants after implementation of the project (modernization of aeration system)
1 – incoming of wastewaters; 2 – first desilt basins; 3 - aerotanks; 4 – second desilt basins; 5 – discharge of treated water into the sea; 6 – mechanical dewatering of raw sludge or active sludge; 7 – inflow of dewatered sludge to the sludge fields.

The process of biological treatment of contaminant substances is carried out in the aerotanks. Direct contact of wastewaters with organisms of active sludge alone with availability of right amount of dissolved oxygen takes place in aerotanks. This allows for further isolation of active sludge from cleaned water that takes place in desilt basins. Active sludge – farmed biocenosis populated with bacteria, simple microorganisms and metazoans that transform contaminants and treat wastewaters due to biosorption and biological oxidation. Oxygenation occurs via barboration of wastewaters with oxygen from the air that comes in through network of holed tubes that are placed at the bottom of aerotanks.
The most important factors that influence the development and vital activity of active sludge as well as quality of biological treatment are: temperature, availability of nutrients, content of dissolved oxygen in sludge mixure, pH index, presence of toxins. Biological treatment is the most power-intensive stage, it uses 85% of needed electric energy at all treatment facilities for wastewater aeration. The role of active sludge is to conduct biological oxidation of organic matters in wastewaters up to single units and process of sorption.

Losses caused by friction can become considerable part of energy usage needed for aeration. This can occur during colmatation (locking) of air dispersants of aeration systems if they are in production for a period longer than their operational life or in cases when the air incoming to the dispersants is unfiltered and dusty.

The project provides for modernization of aerotanks (aeration system). Aerotanks will be equipped with new system of air distribution. When replacing the aeration system with highly effective ones electric energy will be saved by reducing the contact time of wastewater with air. For new and more powerful equipment will provide more air for less time, and this in turn accelerates aeration process and speeds up the process of wastewater treatment in general.

Airblowers and all pumps (including airlifts) will be completely replaced. Four aerators that were custom designed (by “Comunstroy” LLC, Odesa) would be replaced at “Pivnichna” treatment plant. This means complete replacement of aeration systems at “Pivnichna” and “Pivdenna” biological treatment plants is planned to be carried out (information related to replacement of equipment at “Pivdenna” plant – according to typical project TP 902-2-343).

Project provides for the implementation of cycle loading (needed amount of air feed). Adjustment of air feed will be made via special equipment:

- Pressurization blower of extensive operation with ac-to-dc inverter;
- Centered airblowers equipped with special directional control equipment at the entrance.

10. Implementation of small hydroelectric power plant

Implementation of a small hydroelectric power plant provides for installation of a turbine of Francis type that allows for convertation of the kinetic energy of the water flow (of wastewater) into electric energy. Treated wastewater after full range of biological treatment at WWTP “Pivdenna” is discharged into the Black Sea. This will create a differential pressure (free flow of liquid), which can be used to generate electric energy. The design of turbine of Francis type has hydraulics that ensures the weakest water-hammer effect if the lead-in water pipelines are long. Operation of this equipment in the wastewater system provides for self-cleaning ability of a turbine wheel. Implementation of the small hydroelectric power plant will ensure energy independence over time and may allow the sale of surplus electric energy to the national electric grid. This is considered in detail in Section D and Accompanying document 1. The turbine of Francis type produced by CINK Hydro-Energy has the following technical characteristics: N = 400 kW; Q = 1.43 m^3/s; H = 35 m. (Figure 13).

Figure13. Radiaxial turbine of Francis type[6]

Main milestones of the project activities implementation provided by the project are given in the table below:

[6] *http://www.cink-hydro-energy.com/ru/turbina-ossberger?page=francis*

Table 8. Schedule of project implementation

№	Project stages	Period
1	Modernization of pumping equipment	17/12/2003-31/12/2012
2	Replacement of pumping equipment	17/12/2003-31/12/2012
3	Optimization of the technological process of water pumping	17/12/2003-31/12/2012
4	Installation of automatic air valves	17/12/2003-31/12/2012
5	Replacement of Shut-off and control valves	17/12/2003-31/12/2012
6	Replacement of water-supply and drainage networks	17/12/2003-31/12/2012
7	Installation of new group of metering devices	17/12/2003-31/12/2012
8	Installation of frequency regulators	17/12/2003-31/12/2012
9	Modernization of aeration system at treatment plants (aerotanks)	17/12/2003-31/12/2012
10	Implementation of small hydroelectric power plant	01/01/2012-31/12/2012

Results which will be obtained after implementation of such technologies and measures are given in Accompanying documents 1, 2.1, 2.2, 2.3.
31/12/2012 is the final date of all project activities implementation.

“Infoxvodokanal” company makes annual calculations of water losses within the network. Based on such calculations, the company determines scheduled replacements. If the water losses at site don’t exceed standard water losses, the company is not obliged to make scheduled replacement of the pipeline. Pipelines to be replaced as a result of project implementation are not the part of technological maintenance (emergency situations, scheduled replacements). Pipeline replacement is conducted at sites, which don’t exceed planned water losses yet, but are in poor condition.

Technologies to be implemented by the project are state-of-the-art technologies in the sphere of water supply, drainage and wastewater treatment. They are already proven and will result in significantly better productivity. Taking into consideration general economic circumstances, replacement of technologies proposed in the project with more effective technologies is unlikely to take place in the nearest 20-30 years.
Since the core activities of “Infoxvodokanal” won’t change when implementing the Joint Implementation (JI) project, special trainings for the personnel are not necessary. When using new equipment (the one that has not been used before), the company-manufacturer of the equipment should conduct training for the personnel. Technical personal of the enterprise possesses necessary knowledge and experience for execution of project activities and repair of the equipment implemented under the project. The new equipment to be installed doesn’t require any special maintenance. The personnel of “Infoxvodokanal” will carry out maintenance of the new equipment in operating mode (exploitation, scheduled repairs) during the period of the project implementation, and after the project period.

“Infoxvodokanal” retrains the personnel according to the requirements of Norms of labour protection. The enterprise has the Labour Protection Department responsible for professional development and trainings of the personnel.
In the course of elaboration of JI project the specialists of VEMA S.A. carried out broadened consultations for involved representatives of ”Infoxvodokanal” about collection of necessary data according to the Monitoring plan of the project.

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

Reduction of the GHG emissions (CO_2, CH_4) will be attained due to the following measures:

- Reduction of CO_2 due to consumption of less electric energy form the national grid which results from replacement and modernization of pumps, water distribution networks, implementation of frequency regulators, modernization of wastewater treatment system (aerotanks);
- Reduction of CO_2 due to reduced electric energy consumption from the national grid which results from electric energy production due to implementation of a small hydroelectric power plant.

In the absence of the proposed project all equipment, including the old equipment and the one characterized by low efficiency but which is still operable equipment, will work in the usual mode for a long time, and no emission reduction will take place.

But there are several main reasons which make the implementation of the project without the mechanism of joint implementation unlikely to happen:

- There are no legislative documents committing “Infox Ltd.” branch “Infoxvodokanal to additionally modernize pumping and treatment equipment of water distribution networks;
- No significant changes in the legislation of Ukraine in the water supply and drainage, which could force the company to give up the existing practices, are expected;
- Currently, there are no restrictions for Ukrainian enterprises regarding GHG emissions, and they are unlikely to be imposed by 2012;
- Additional, quite risky financial investments and risks connected with new equipment exploitation in the absence of a JI project.

A.4.3.1. Estimated amount of emission reductions over the crediting period:

In the course of the project implementation, the following emission reductions will be achieved at each stage of the project:

Table 9. Estimated amount of emission reductions before the first commitment period (2004 - 2007)

	Years
Length of the crediting period	4
Year	Estimated annual emission reductions in tonnes of CO_2 equivalent
2004	40 178
2005	72 429
2006	93 636
2007	116 495
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	322 738
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	80 685

Table 10. Estimated amount of emission reductions during the first commitment period (2008-2012)

	Years
Length of the crediting period	5
Years	Estimated annual emission reductions in tonnes of CO_2 equivalent
2008	151 856
2009	166 511
2010	178 661
2011	192 459
2012	195 576
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	885 063
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	177 013

Table 11. Estimated amount of emission reductions after the first commitment period (2013-2017)

	Years
Length of the crediting period	5
Years	Estimated annual emission reductions in tonnes of CO_2 equivalent
2013	195 576
2014	195 576
2015	195 576
2016	195 576
2017	195 576
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	977 881
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	195 576

More detailed information is given in the Accompanying Document 1.

Description of formulae used for preliminary estimation of emission reductions is given in Section D and Accompanying Document 1.

A.5. Project approval by the parties involved:

The Letter of Endorsement №644/23/7 of “Development and improvement of water supply system, drainage system and wastewater treatment of «Infox Ltd.» branch «Infoxvodokanal»” project was issued by to the National Environmental Investment Agency of Ukraine as on March 25, 2011. After analyzing the project, the PDD and Determination report will be submitted to the National Environmental Investment Agency of Ukraine to obtain a Letter of Approval. The second letter of approval will be received from the other party-participant of the Joint Implementation project.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

The project baseline is set under requirements of Appendix B to Decision 9/CMP.1 (JI Methodological guidelines) and paragraphs 23-29 of "Guidance on criteria for baseline setting and monitoring"[7] developed by Joint Implementation Supervisory Committee (JISC) (hereinafter - the "Guidance"). According to the above stated Guidelines, the project participants may use approved under the Clean Development Mechanism (CDM) methodologies for developing the baseline and monitoring (paragraph 9 (b)) or they may establish a baseline in accordance with Appendix B of the JI Guidelines (paragraph 9 (a) of the Guidance), at the same time, if necessary, using some elements or combinations of approved CDM methodologies for developing the baseline and monitoring (paragraph 11 of the Guidance).
When choosing the baseline for the JI project a specific approach was used.

Establishing of the baseline

The baseline scenario is a scenario that accurately describes the anthropogenic emissions by sources of greenhouse gases that would have occurred in the absence of the proposed project under the Methodological guidelines of JIP, Appendix B. As none of the approved methodologies for baseline setting and monitoring for CDM may not fully apply to this project, probable future scenarios are defined based on conservative assumptions (paragraph 24 of the Guidelines).

The choice of the baseline is based on determining of the most probable alternatives. The alternatives for facilities of «Infox Ltd.» branch «Infoxvodokanal» are the following.

Alternative ways of electric energy consumption:

Alternative 1.1: Operation of existing equipment will continue (continuation of the current situation), and electric energy consumption will increase.
Alternative 1.2: Modernization of (the proposed project activity) without the use of Joint Implementation mechanism.
Alternative 1.3: Reduction of project activities, the exclusion of any non-key activities from the project, for example, exclusion of frequency control from the implementation project, etc.
None of the abovementioned alternatives contradicts the legislation of Ukraine.
The detailed analysis of each alternative is stated below.

Alternative 1.1

Operation of existing equipment will continue (continuation of the current situation), and electric energy consumption will increase.
Since the operation of existing equipment does not require significant investment, despite the fact that the equipment is exhausted and it exceeded its design service life, the old system that supplies citizens of Odesa city and some territories of Odesa region could still continue to operate.

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[7] http: // ji.unfccc.int/Ref/Guida.html

Despite the fact that the equipment at «Infox Ltd.» branch «Infoxvodokanal» exceeded its design service life, its further use is allowed by Energy-mechanical Service of the company in compliance with the legislation of Ukraine "On Drinking Water and Water Supply"[8]. This practice is widespread in Ukraine.
This alternative is most likely to happen because the company is able to meet the needs of consumers without the project.
Accordingly, *Alternative 1.1* can be viewed as the most probable baseline.

Alternative 1.2

Modernization (the proposed project activity) without the use of Joint Implementation mechanism.
The project implementation will allow for reduction of electric energy consumption by modernization and development of centralized water supply system, including replacement and modernization of pumps and water distribution networks, installation of frequency regulators, optimization of the process of water pumping and wastewater treatment system (aerotanks). Implementation of the above said technologies will reduce greenhouse gas emissions (t CO_2).
The project implementation is connected with overcoming significant technical and operational barriers, as well as commercial risks. This is due to the complexity and novelty of technology to be used for the project. In addition, such projects have not become a customary practice in water supply, drainage and wastewater treatment.
When implementing the project the company will face the risks associated with lack of experience in implementation and operating of such equipment as well as construction of a small hydroelectric power plant. In addition, the project implementation requires considerable investments. Economic indicators of the project without the involvement of JI will be low compared to alternative options. Thus, without outside investment this project is unlikely to be implemented, as technical solutions are complex, and the construction and operation of facilities are associated with difficulties. Thus, the probability of *Alternatives 1.2* implementation (without the JI project) is very low, although it will be considered when analyzing investments.

Alternative 1.3

Modernization without the use of JI mechanisms and with the exclusion of any non-core activities from the project. Economic efficiency of the project depends on a complex of energy-efficient measures implementations, partial implementation of the project will lead to local improvements of the work of equipment, but it will not promote reduction of power consumption.

Analysis of the alternatives described above shows that *Alternative 1.1* is the most probable, and *Alternative 1.2* as well as *Alternative 1.3* are the least probable

Table 12. Analysis of the alternatives 1.1 – 1.3

№ of Alternatives	Alternative	Low probability	High probability
1.1	Operation of existing equipment will continue (continuation of the current situation), and		•

[8] *http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=2196-15*

	electric energy consumption will increase.		
1.2	The project implementation is carried out by means of modernization (the proposed project activity) without the use of Joint Implementation mechanism.	•	
1.3	The project implementation is carried out by means of reduction of project activities, the exclusion of any non-core activities from the project, for example, exclusion of frequency control implementation from the implementation project, etc.	•	

Alternative ways of electric energy production

The following is the evaluation of alternative variants that can be considered as an alternative for the project baseline.

Alternative 2.1.: Using of thermal and electrical energy from external sources, for instance from the nearest thermal power plant.
Alternative 2.2.: Installation of a turbine on the boiler equipment.
Alternative 2.3.: Installation of a turbine on the main conduits – a small hydroelectric power plant.
None of the abovementioned alternatives contradicts the legislation of Ukraine. The detailed analysis of each alternative is stated below.

Alternative 2.1

Using of thermal and electrical energy from external sources, for instance from the nearest thermal power plant (TPP).
The alternative cannot be considered as probable, because the company has begun a boiler house construction, where fossil fuels - natural gas is used. The dismantling of this boiler house and shift to TPP heat purchases will increase financial costs for the enterprise. Furthermore, it would mean a dependence on outside heat suppliers and would mean higher spending of the company in case thermal energy rates increase. To provide heat from TPP, the enterprise will have to build a heat distributing network. Construction of heat distributing network leads to increase in operating costs.
Therefore, *Alternative 2.2* cannot be considered as the probable baseline.

Alternative 2.2

Installation of a turbine on the boiler equipment.
At first glance, this option is the most appropriate for the enterprise. Installing of turbines on the project equipment will allow producing electric energy for company’s own needs. The company would no longer depend on outside suppliers, this would protect the company from risks related to constant electric energy supply and reduce spending on purchase thereof.
However, this option cannot be considered as a baseline one, because steam production is not stipulated by the project. In this case it would be necessary to dismantle the parts of constructed boiler house and correspondingly introduce changes to the Project Design Documentation that would lead to increase of financial losses of the company.
Therefore, *Alternative 2.2* cannot be considered as the probable baseline.

Alternative 2.3

Installation of a turbine on the main conduits.
This alternative variant is an acceptable alternative for this company. Installation of a turbine on the main conduits would allow for generation of electric energy for the company's own needs. Thus, the company stops depending on external suppliers, which would protect it from risks connected with uninterrupted electric energy supply, which in turn would reduce procurement costs to buy electric energy.
But such projects are not a customary practice, neither at some plants nor in the country in general.
When implementing the project the company will have to face the risks associated with lack of experience in building and operating of such equipment. In addition, the project implementation requires a considerable financial expenditures. The economic performance of the project will be low without the involvement of JI mechanism in comparison with alternative options.
Thus, without involving an outside investment the project is unlikely to be implemented, because such technical solutions are complex, and the construction and operation of facilities are connected with difficulties.
Hence, a probability of *Alternatives 2.3* (without the JI project) implementation is low, although it will be considered during an investment analysis.

Analysis of the alternatives described above shows that *Alternative 2.2* is the most probable, and *Alternative 2.1 as well as Alternative 2.3* are the least probable.
Table 13. Analysis of the alternatives 2.1 – 2.3

№ of Alternatives	Alternative	Low probability	High probability
2.1	Using of thermal and electrical energy from external sources, for instance from the nearest thermal power plant.	•	
2.2	Installation of a turbine on the boiler equipment.		•
2.3	Installation of a turbine on the main conduits.	•	

Conclusion
Analysis of investments (see Section B.2) showed that the analyzed project implementation alternatives, including *Alternative 1.2* (the project without the involvement of JI mechanism), could not be considered as the most attractive from a financial point of view. Substantiation of this conclusion is given in Section B.2.
As a result of evaluation of several alternatives the most probable of them have been identified and will be used as a baseline:

- *Alternative 1.1*: Operation of existing equipment will continue (continuation of the current situation), and electric energy consumption will increase;

Detailed description of the baseline scenario
The baseline scenario provides for operation of existing equipment, water supply, drainage and wastewater treatment in the city of Odesa, which is characterized by continuing worsening and lowering of effectiveness of the pump, water distribution and treatment equipment. However, at the same time

routine, on-the-spot and capital repairs do not increase efficiency and this greatly aggravates and increases annual total emission level (the Baseline) over the following years.

Baseline setting will be carried out under a specific approach for joint implementation projects for each year. The sale of emission reductions will takes place therein, to improve and perfect the systems of:

- water supply by water distribution networks;
- wastewater drainage to treatment plants;
- wastewater treatment and discharge thereof to the Black sea basin.

The level of activity is reflected by annual electric energy consumption. Implementation of new and modernization of old equipment under the project took place at the end of 2003. With the view of conservatism, reduction due to these implementations are not considered in the project, to calculate the Baseline the period of 2000-2003 was taken. Specific electric energy consumption in the baseline scenario is calculated based on the assumption of its linear growth with time. This occurs for several reasons:

- permanent reduction of efficiency of pumping equipment with time and efficiency of the pumping plant;
- steady increase in losses of water supply and drainage networks.

This linear dependence is based on historical data for the period of 2000-2003 (for water-supply and wastewater treatment) and 2001-2004 (for drainage system) using the method of least squares. Detailed information is given in **Section D. 1.**

Detailed Description of project scenario

Project scenario involves modernization of water supply, drainage and wastewater treatment systems (aeration). The project implementation will reduce electric energy consumption by installing frequency regulators, new pumping equipment, new aeration system, optimization of the technological process of water and wastewater pumping.

In addition, a small hydroelectric power plant is planned to be installed; the turbine thereof would generate electric energy using differential pressure (free flow of fluid) of treated wastewater at discharge into the sea. This electric energy can also be used instead of electric energy, which was previously bought from the national grid of Ukraine.

The main factors determining the greenhouse gas emissions

1. Greenhouse gas (GHG) emissions due to consumption of electric energy used by the water supply system.
2. GHG emissions due to consumption of electric energy used by the drainage system.
3. GHG emissions due to consumption of electric energy used by the wastewater treatment system.

Detailed information is given in **Section D and Accompanying document 1.**

Thus, according to the above described alternatives, the analysis and selection of these alternatives some conclusions can be made. During the project development there were no approved CDM methodologies for the projects implemented in Ukraine which could be applied to the unsatisfactory current activities of this kind. The proposed project uses a specific approach for joint implementation projects based on the approved by the UN Framework Convention on Climate Change Executive Committee clean development mechanism baseline methodology:

1. AM0020 «Baseline methodology for water pumping efficiency improvements» (Version 2)[9].

[9] *http:cdm.unfccc.int.methodologies/DB/THOMTJCOKYJYYMQLL9B71Q9QJHOPZ9/view.html*

Modernization

This type of modernization refers to the sector "**Energy Demand**". Current "Infoxvodokanal" activity is characterized by continuous worsening of water supply system, drainage system and wastewater treatment system as well as high and inefficient power consumption. This results from a lack of funds for modernization and replacement of the equipment as well as implementation of new technologies.
The project activity is targeted at reducing of greenhouse gas emissions by the national power grid due to modernization of water supply, drainage systems and wastewater treatment system facilities in Odesa city: replacement of old pumping units with new and modern ones, replacement of water distribution networks, implementation of new technologies of water supply and drainage, modernization of wastewater treatment.

Table 14. Application of the methodology AM0020 (version 02)

Applied AM0020 (version 02)	Project activities
This methodology may be applied for the project activities, which:	
(a) try to reduce GHG emissions due to reduction of energy quantity necessary for water supply to end users in municipal water and wastewater treatment plants.	(a) project activities provide for decrease in electric energy consumption, necessary for water supply to end users in municipal water and wastewater treatment plants.
(b) increase efficiency of energy consumption in the system of water pumping, including decrease in technical loss and leakage of water, as well as energy efficiency of pump schemes consuming electric energy from electrical supply networks, where:	(b) project activities provide for increase in efficiency of energy consumption in the system of water pumping, including decrease in technical loss and leakage of water, as well as energy efficiency of pump schemes consuming electric energy from electrical grid, where:
(1) increase in efficiency (energy and water) of already existing schemes of water supply	(1) project activity provides for increase in efficiency (energy and water) of already existing schemes of water supply.
(2) elaboration of new schemes that will replace the old one, which will not be used anymore. This method will apply to new scheme only for measurement of capacity (annual volume of supplied water) of old scheme.	
(e) this methodology can not be applied for project activities in cases of development of absolutely new schemes for increase in available potential. Only emission reductions up to existing potential of the system will be considered.	(e) project activity provide for increase in efficiency (energy and water) of already existing schemes of water supply.

(f) this methodology shall be applied in combination with the approved monitoring methodology AM0020 ("Methodology for water pumping efficiency improvements"[10]).	(f) Specific approach elaborated for this project applies monitoring methodology AM0020 ("Methodology for water pumping efficiency improvements").

It is impossible to apply Methodology AM0020 in full since the formulae for preliminary estimation of project emission reductions include exact values of electric energy consumption and volumes of water supplied to the system. In our case it is impossible to state necessary quantity of electric energy for water pumping to the consumer in project year. Specific approach based on efficiency factor of pumping equipment is applied to improve accuracy of preliminary calculations.

In the absence of pumping equipment modernization efficiency will continually decline. The limit of the decrease in efficiency of pumping plant operation is deemed to be 49-60% in the baseline scenario. Based on the opinion of leading specialists of the Ukrainian Water Association[11], where it is stated that when the efficiency of the pumping plant is lower than 50% the use of electric energy and water pumping becomes irrational, and thus, it is a lower level of pumping plant operation, which must be constantly maintained and modernized. Thus, when efficiency of a pumping plant decreases to 49% linear increase in the baseline specific rate of electric energy consumption will be stopped and fixed until the end of the calculation of greenhouse gas emissions on condition of carrying out of routine and capital repairs at pumping plants.

That is, the current operation of water supply system, drainage system and wastewater treatment in the city of Odesa is characterized by continuing worsening and lowering of effectiveness of the pump, water distribution and treatment equipment. However, at the same time routine and capital repairs do not increase efficiency and this greatly aggravates and increases annual total emissions level (the Baseline) over the years. That is, under such conditions the efficiency of the pumping plant actually decreases to the level that is lower than 50%.

Baseline setting will be carried out under the specific approach for joint implementation projects for each year when the sale of emission reductions takes place. Is was elaborated to average the uniform water supply by water distribution networks (wastewater drainage by drainage networks), that influences the baseline, to average the volume of sludge transferred to sludge fields and to average the efficiency factor, which will demonstrate the state of effectiveness of water supply, drainage and wastewater treatment systems in project year in the absence of the joint implementation project.

Detailed information is given in Section D. 1.

Thus, when estimating GHG emission reductions due to modernization of pumping equipment of treatment plants that pumps sludge into sludge fields and of aeration system (airblowers) that feed air to aerotanks, it is impossible to apply Methodology AM0020 in full since the formulae for preliminary estimation of GHG emission reductions include exact values volumes of supplied water and wastewater that was pumped over.

For the calculation of GHG emission reductions a specific approach is used. It is based on the amount of the sludge transferred to sludge fields. Volume of the transferred sludge is determined by using indicators:

- The volume of incoming waste at wastewater treatment plants (determined by flow meters);

[10] h*ttp://cdm.unfccc.int/methodologies/DB/TH0MTJC0KYJYYMQLL9B71Q9QJHOPZ9*

[11] *http://www.cleanwater.org.ua/*

- The concentration of pollutants in waste water (the main indicator of pollutants of biological origin is BOD_{20} that is determined by means of laboratory tests).

Consumption of electric energy in basic year is given in the Table 15.

Table 15. Basic consumption of electric energy

Year	«Infox Ltd.» branch «Infoxvodokanal»			
	Basic consumption of electric energy, kW*h			
	Water supply pumping plants	Pumping plants of treatment facilities	Year	Drainage pumping plants
2000	48962000	26179670	2001	36487890
2001	46304000	25835620	2002	36205110
2002	38840000	24595000	2003	41203960
2003	40283000	24077000	2004	38378740

Detailed information is given in Accompanying document 1.

Status and correspondence of current water-supply and drainage systems
Current operation of water supply system, drainage system and wastewater treatment in the city of Odesa is based on pumping equipment of Ukrainian or Russian manufacturers, including: 1D-1250-63a, 22NDS, 24NDSV, 5NDV, 8NDV, 20NDS, 14D-6, 350A-90A, 4NDV and some other types. Detailed information is given in Accompanying documents 2.1-2.3. Current efficiency of these pumps is 50-60% and it is decreasing every year.

There are two types of water leakage at this enterprise: productive and nonproductive; this is a current practice of water supply system exploitation in Ukraine. Such losses include own needs of water supply company (water spending for preventive maintenance of water supply networks, disinfection and washing of technological constructions and leakage therefrom, etc.). The main component of water loss is deemed to be water leakage from water distribution network. The company is obliged to make annual theoretical calculation in accordance with the order [12] of the State Commettee of Ukraine on housing and community amenities # 33 as of 17.02.2004 and actual calculation of water loss from water-supply system. Results of calculations in reporting form[13] shall be submitted to the State committee of water industry of Ukraine"[14]. Available distribution networks of «Infoxvodokanal» Ltd. are characterized by averaged losses from 40 to 50%.

Calculation of total annual baseline carbon emissions, which would take place during the baseline year if the water supply system in the city of Odesa remained unchanged, are given in the Accompanying document 1 (the Baseline). They consist of accurate amount of total CO_2e emissions, which took place during 2000-2003 basic years.

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[12] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=z1557-04%20

[13] http://search.ligazakon.ua/l_doc2.nsf/link1/ZX000218.html

[14] http://www.scwm.gov.ua/

Key information for baseline setting is stated in the tables given below:

Data/Parameter	EF_y
Data unit	t CO_2e/ t. kW*h
Description	Carbon emission factor for Ukrainian electrical grid
Time of determination/monitoring	Once, at the beginning of the project
Source of data (to be) used	Research data of Global Carbon B.V. [15]
Value of data applied (for ex ante calculations/determinations)	0.896 (0.916)
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	N/A
Any comment	Researches don't take into consideration production of energy by nuclear power plants

Data/Parameter	EF_g
Data unit	t CO_2e/ t. kW*h
Description	Carbon emission factor for Ukrainian electrical grid when electric energy is generated by the small hydroelectric power plant
Time of determination/monitoring	Once, at the beginning of the project
Source of data (to be) used	Research data of Global Carbon B.V.
Value of data applied (for ex ante calculations/determinations)	0,896
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	N/A
Any comment	Researches don't take into consideration production of energy by nuclear power plants

Data/Parameter	$EC^{j}_{b,w}$
Data unit	t. kW*h
Description	Total quantity of electric power, necessary for water transportation in water supply system *«w»* in the period

[15] *Carbon Emission Factors (EF) for 2003-2005 are taken from Table 8: Baseline carbon emissions for the JI projects that reduce electricity consumption "directory for the operating AP JI (ERUPT 4, Senter, The Netherlands.) Emission of carbon dioxide (for consumption of electricity according to the methodology "Ukraine - Assessment of new calculation of CEF", approved by TUV SUD 17.08.2007). EFy - Carbon Emission Factors (EF) for Ukraine for the period 2006-2012, taken from the «Study" Standardized emission factors for the Ukrainian electricity grid "(Version 5, 02 February 2007) developed by Global Carbon B.V».*

Time of determination/monitoring	Determined before the beginning of the project in 2000-2003 basic years
Source of data (to be) used	Data of electric meters installed at pumping plants
Value of data applied (for ex ante calculations/determinations)	Year / $EC^{j}_{b,w}$: 2000 – 48962000; 2001 – 46304000; 2002 – 38840000; 2003 – 40283000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0020 (version 02)
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data which allows to calculate the GHG emissions in the project period, information will be archived in paper and electronic forms.

Year	$EC^{j}_{b,w}$
2000	48962000
2001	46304000
2002	38840000
2003	40283000

Data/Parameter	$EC^{j}_{b,m}$
Data unit	t. kW*h
Description	Total quantity of electric power, necessary for wastewater transportation by drainage system *«m»* by pumping plants in the period
Time of determination/monitoring	Determined before the beginning of the project in 2001-2004 basic years
Source of data (to be) used	Data of flow meters installed in sewage pumping plants
Value of data applied (for ex ante calculations/determinations)	Year / $EC^{j}_{b,m}$: 2001 – 36487890; 2002 – 36205000; 2003 – 41203000; 2004 – 38378000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Consumption of electrical energy is determined with the help of electric meters
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data which allows to calculate the GHG emissions in the project period, information will be archived in paper and electronic forms.

Year	$EC^{j}_{b,m}$
2001	36487890
2002	36205000
2003	41203000
2004	38378000

Data/Parameter	$EC^{j}_{b,t}$
Data unit	t. kW*h
Description	Total quantity of electric power, used by system of aerotanks «t» in the period
Time of determination/monitoring	Determined before the beginning of the project in 2000-2003 basic years
Source of data (to be) used	Data shown on the meters installed in wastewater treatment plants

	("Pivnichna", "Pivdenna")
Value of data applied (for ex ante calculations/determinations)	<table><tr><th>Year</th><th>$EC^{j}_{b,t}$</th></tr><tr><td>2000</td><td>26179670</td></tr><tr><td>2001</td><td>25835000</td></tr><tr><td>2002</td><td>24595000</td></tr><tr><td>2003</td><td>24077000</td></tr></table>
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Consumption of electrical energy is determined with the help of electric meters
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data which allows to calculate the GHG emissions in the project period, information will be archived in paper and electronic forms.

Data/Parameter	$EC^{y}_{b,g}$
Data unit	t. kW*h
Description	Total quantity of electric power, to be substituted with electric energy generated by the small hydroelectric power plant
Time of determination/monitoring	Determined before the beginning of the project in 2011 basic year
Source of data (to be) used	Data of electric meters installed at the small hydroelectric power plant
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Consumption of electrical energy is determined with the help of electric meters
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data which allows to calculate the GHG emissions in the project year, information will be archived in paper and electronic forms.

Data/Parameter	$V^{j}_{b,w}$
Data unit	m^3
Description	Total volume of pumped water to consumers by water supply system *«w»* in the period
Time of determination/monitoring	Determined before the beginning of the project in 2000-2003 basic years
Source of data (to be) used	Data of flowmeters installed at lifting plants
Value of data applied (for ex ante calculations/determinations)	<table><tr><th>Year</th><th>$V^{j}_{b,w}$</th></tr><tr><td>2000</td><td>199898300</td></tr><tr><td>2001</td><td>199698000</td></tr><tr><td>2002</td><td>162043000</td></tr><tr><td>2003</td><td>131501000</td></tr></table>
Justification of the choice of	Methodology AM0020 (version 02)

data or description of measurement methods and procedures (to be) applied	
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data which allows to calculate the GHG emissions under the baseline scenario, information will be archived in paper and electronic forms.

Data/Parameter	$V_{b,m}^{j}$
Data unit	m^3
Description	Total volume of wastewater pumped over by drainage system *«m»* in the period
Time of determination/monitoring	Determined before the beginning of the project in 2001-2004 basic years
Source of data (to be) used	Data of flowmeters (volume of wastewater) installed at wastewater pumping plants
Value of data applied (for ex ante calculations/determinations)	Year: $V_{b,m}^{j}$ — 2001: 139373000; 2002: 135411000; 2003: 133228000; 2004: 121658000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Research data of the company
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data which allows to calculate the GHG emissions under the baseline scenario, information will be archived in paper and electronic forms.

Year	$V_{b,m}^{j}$
2001	139373000
2002	135411000
2003	133228000
2004	121658000

Data/Parameter	$V_{b,t}^{j}$
Data unit	m^3
Description	Total volume of wastewater pumped over to the system of aerotanks *«t»* in the period
Time of determination/monitoring	Determined before the beginning of the project in 2000-2003 basic years
Source of data (to be) used	Data of flowmeters (volume of wastewater) installed at wastewater treatment plants ("Pivnichna", "Pivdenna") and laboratory analysis (concentration of BOD in wastewaters)
Value of data applied (for ex ante calculations/determinations)	see table below

Year	$V_{b,t}^{j}$
2000	139373410
2001	139373000
2002	135411000
2003	133228000

Justification of the choice of data or description of measurement methods and procedures (to be) applied	Research data of the company
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data which allows to calculate the GHG emissions under the baseline scenario, information will be archived in paper and electronic forms.

Data/Parameter	$BOD_{b,t}^{j}$
Data unit	mg/l
Description	Biological oxygen demand (BOD_{20}) in the system of aerotanks "*t*" in the period.
Time of determination/monitoring	Determined at the beginning of the project in the baseline 2000-2003 years
Source of data (to be) used	Laboratory analysis of "Pivnichna" and "Pivdenna" wastewater treatment plants and (BOD_{20} concentration in the waste)
Value of data applied (for ex ante calculations/determinations)	Year / $BOD_{b,t}^{j}$ «Pivnichna» / $BOD_{b,t}^{j}$ «Pivdenna»: 2000 / 135,20 / 83,50; 2001 / 135,10 / 84,00; 2002 / 133,30 / 82,50; 2003 / 129,70 / 62,20
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Data of the company
QA/QC procedures (to be) applied	Chemical and biological analysis of company laboratories
Any comment	Data which allows to calculate the GHG emissions under the baseline scenario, information will be archived in paper and electronic forms.

Value of data applied (nested table):

Year	$BOD_{b,t}^{j}$ «Pivnichna»	$BOD_{b,t}^{j}$ «Pivdenna»
2000	135,20	83,50
2001	135,10	84,00
2002	133,30	82,50
2003	129,70	62,20

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

The baseline scenario. In the absence of the proposed project, all equipment, including old, characterized by low efficiency, but still serviceable equipment, will work as normal for a long time, and reduction of emissions will not take place.

Project scenario. Anthropogenic emissions of greenhouse gases in project scenario will be decreased due to complex modernization of pumping, water-distribution equipment and treatment equipment (aeration system) by introduction of technologies that are proposed in project activity and that are described above, which include replacement of old pumps with new high efficiency pumps, frequency regulators installation and modernization of old water-distribution networks, modernization of aerotanks (aeration system).
Reduction of greenhouse gas emissions in the project scenario will be achieved by:

- Saving of traditional carbon fossil fuel at power plants, which will reduce emissions of tCO_{2e} from the national electrical grid;
- Reduction of emissions that were connected with the production of electric energy, which will be substituted in the project scenario with electric energy generated by means of the small hydroelectric power plant.

Additionality of the project. The additionality of the project activity is demonstrated and assessed by using the "Tool for the demonstration and assessment of additionality" [16] (Version 05.2). This manual was elaborated in original for CDM projects, but it may be also applied to JI projects.

STEP 1. Identification of alternatives to the project activity and their conformity with current laws and regulations

Step 1a: Define alternatives to the project activity

There are three alternatives of this project.

Alternative 1: The first alternative is continuation of existing situation (there is no project activity or other alternatives), i.e. scenario "business as usual" with carrying out of minimal repair works against the background of total degradation of water supply, drainage systems and wastewater treatment system.

It should be noted that there is no local legislation in relation to the period of replacement of pumps, aerotanks and their maximal period of operation. Customary practice is exploitation of pumps installed in the seventies and even sixties-fifties and earlier, if they underwent technical examination of the authorized body (State Inspectorate of Labor Protection).

Alternative 2: The second alternative is modernization (proposed project activity) without involving of Joint Implementation mechanism.

Alternative 3: The third alternative is reduction of project activity, exclusion of any non-core measures from the project, for example, exclusion of frequency regulation from the project implementation, etc.

Conclusion on Step 1a: Three realistic alternatives to the project activity were identified.

Step 1b: Consistency of the alternatives with mandatory laws and regulations

Alternative 1: According to the Ukrainian Law "On drinking water and drinking water supply" [17] entrepreneurial activity in the sphere of supply of drinking water to consumers shall be licensed. There are no any legislative documents binding the enterprise "Infoxfovokanal" to modernize pumping equipment, water treatment and water-distribution networks. In accordance with the law "On drinking water and drinking water supply" the enterprise is obliged only to maintain the system in good running order and prevent accidents. Current practice of water leakage detection and elimination corresponds to all current laws and standards of Ukraine. Legislation admits water losses. Standards stipulate only periodicity of calculations of water losses from water-distribution networks to be made by the water-distribution organizations. "Infoxvodokanal's" practice of water loss detection corresponds to stated standards. Control of adherence to the standards is executed by calculation of water loss of distribution systems once per 10 years.

The project also conforms to existing regulatory requirements in Ukraine concerning detection of water loss at water-distribution networks, and to any other current applicable legislative norms.

Alternative 2: Modernization without JI mechanisms application shall be consistent with statutory laws and decrees; detailed information about analysis of conformity with the legislation was elaborated for

[16] *http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf*

[17] *http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=2918-14*

Alternative 1, The analysis of conformity with statutory laws and decrees of Alternative 2 is the same as the one for Alternative 1.

Alternative 3: Modernization without JI mechanisms application and with exclusion of any non-core measures from the project shall be consistent with statutory laws and decrees; detailed information about analysis of conformity with the legislation was elaborated for Alternative 1. The analysis of conformity with statutory laws and decrees of Alternative 3 is the same as the one for Alternative 1 and Alternative 2.

Conclusion on Step 1b: Under such conditions one may say that all scenarios don't contradict with current laws and regulatory acts. Hence, the Step 1 is satisfied.

STEP 2. Investment analysis

Step 2a: Determine appropriate analysis method

According to the art. 191 of the Civil Code of Ukraine state (communal) fixed prices (tariffs) shall be established for products (services) that are manufactured by business entities-monopolists and are of great social importance for population. In this connection branch "Infoxvodokanal" is not entitled to establish the prices (tariffs) for rendered services: water supply and drainage. According to the art. 28 of Ukrainian Law "On local self-government in Ukraine" executive committees of village, urban and city councils are entitled to establish the tariffs of personal, communal, transport and other services, including water supply and drainage services. At present branch "Infoxvodokanal" elaborates tariffs for water supply and drainage services, which shall be approved (agreed) afterwards in case of absence of any objections on the part of executive committees.

In connection with applicable Procedure of setting tariffs for water supply and drainage[18], reduction of expenses as to electric energy for water supply and drainage will not bring in return to the enterprise, since according to this Procedure reduction of expenses for electric energy results in decrease of tariffs for end consumers. Thus the enterprise doesn't obtain additional revenue, and reduction of expenses for electric energy results in decrease of enterprise's revenue due to tariff reduction.

The following steps have been done according to the additionality tools of the CDM Executive Committee "Tool for the demonstration and assessment of additionality[19]" (revision 05.2).

***S*tep 2b**

Alternative I. Application of simple cost analysis

Project implementation will require costs in addition to existing costs for modernization of water-supply system, drainage system and wastewater treatment in the city of Odesa and adjoining towns. Additional costs of Project implementation include the costs of: purchase of new pumping equipment, modernization of existing pumps, aerotanks, installation of new frequency regulators, purchase of pipes, preventative maintenance, systematic data collection, etc. Expenses as to implementation and realization of the project «Development and improvement of water supply system, drainage system and wastewater treatment of «Infox Ltd.» branch «Infoxvodokanal» consist of:

1. Replacement and modernization of pumping equipment: 14,291 mln. UAH;
2. Replacement of water distribution networks: 96,044 mln. UAH;
3. Costs of modernization of aerotanks: 13, 915 mln. UAH;
4. Implementation of frequency regulation: 7,684 mln. UAH;
5. Implementation of the small hydroelectric power plant: 1,82 mln. UAH.

Equipment used in this project is the best in terms of Efficiency Factor, quality of execution and applied technical solutions among the materials and equipment available on Ukrainian market. Availability of spare parts in Ukraine was an important parameter of equipment selection.

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[18] *http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=959-2006-%EF*

[19] *http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf*

As a result of current practice all losses of electric energy are borne by end consumers of services rendered by “Infox Ltd.” branch “Infoxvodokanal” (population, companies of Odesa and Odesa region) that is why branch “Infoxvodokanal” has not incentive to introduce power efficient equipment.
At the moment of project’s beginning pumping plants of branch “Infoxvodokanal” use old pumping equipment manufactured in the USSR.
Application of Kyoto mechanisms to this project makes these measures economically efficient and is the only way for their implementation.
As emission reduction does not bring any economic benefit to branch “Infoxvodokanal”, except for the benefit achieved under the Joint Implementation Project (JIP), we can make a conclusion that Project implementation without receiving proceeds under the JI project is impossible as there appear obstacles for investments.

Alternative 2. Application of investment comparison analysis
Not applicable. The baseline scenario does not involve investment.

Alternative 3. Application of comparative analysis for the benchmarks
Not applicable. Tariffs do not take into account the investment component and profitability, so the comparison of financial indicators such as Net Present Value (NPV) and Internal Rate of Return (IRR) is impossible for project implementation.
Conclusion on Step 2b: In connection therewith it is obvious that this project is economically unattractive without registration of the project as JI project, which proves additionality of this project.
Therefore Step 2 is satisfied.

STEP 3: Barrier analysis

Step 3a: Identify barriers that would prevent the implementation of the proposed project activity:

Financial barriers

Additional expenses on the project implementation include the costs of:
- Modernization of current pumping equipment;
- Purchase and introduction of new pumping equipment;
- Purchase and introduction of frequency regulators;
- Purchase and replacement of water-supply networks;
- Installation of new group of metering devices;
- Modernization of aerotanks (aeration system);
- Implementation of a small hydroelectric power plant.

Financial barriers are connected with the structure of existing tariffs for water supply and drainage that are regulated by the state, and don’t include depreciation and investment needs of water suppliers. Such situation leads to permanent lack of funds and impossibility of timely performance of capital repair, ensuring of equipment operation, investment into modernization and development of water-supply infrastructure.

Technological barriers

The project includes the installation and operation of equipment that is new to Ukraine.

Only one project is known in the former Soviet countries, where similar technology to the technology proposed in this project is used - modernization of biological treatment plant in Chisinau in Moldova.
In Ukraine (or neighboring countries with similar levels of access to technology and financial resources), there are no similar projects implemented that are not registered as JI / CDM.
Lack of practical experience and skilled labor for work with facilities proposed for the project implementation (construction of the small hydroelectric power plant, replacement of pumps by modern pumps produced by foreign manufacturers) may be a barrier. To ensure reliable operation of the system additional costs for training specialist are needed.

Organizational barriers

Experience in JI projects implementation management including conducting of international negotiations, validation, verification, registration, monitoring, etc. is absent.

Step 3 b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

One of the alternatives is continuation of “business as usual”. Since the barriers identified above directly relate to investment into modernization of water supply and drainage systems in the city of Odesa and adjoining towns, branch “Infoxvodokanal” doesn’t have any obstacles for subsequent exploitation of water supply and drainage system at previous level.
Conclusion on Step 3b: Identified barriers can not impede introduction of at least one alternative scenario – continuation of «business as usual». Therefore Step 3 is satisfied.

STEP 4: Common practice analysis

Step 4a. Analysis of other alternatives similar to proposed project activities

Analysis of project activity similarity demonstrated absence of similar projects in Ukraine. “Modernization of water supply and drainage system ”Luganskvoda Ltd.” is similar project but it does not include measures for the wastewater treatment system. This project was implemented by selling emission reduction units. Absence of financial incentives, described in Step 2 and barriers described in Step 3, concern not only branch “Infoxvodokanal”, but also other companies operating water-distribution networks in Ukraine. In this respect existing practice of equipment maintenance represented in the variant of basic conditions chosen for this Project is customary for Ukraine. Due to current practice all losses of electric energy are borne by end consumers of services rendered by water and wastewater treatment plant (population and companies in Odesa and Odesa region); that is why the companies engaged in water supply don’t have incentives for energy effective projects implementation.
Conclusion on Step 4a: As a whole the same pumping equipment and water-distribution networks are used in Ukraine as in the city of Odesa.

CONCLUSION
Based on the demonstration of additionality requirements of the mechanism proposed project is additional to the one that might take place in the case the project implementation doesn’t occur.

B.3. Description of how the definition of the project boundary is applied to the project:

Geographical boundaries of the project coincide with the territory of the city of Odesa and some adjoining towns in Odesa region. «Infox Ltd.» branch «Infoxvodokanal» is divided into subdepartments and departments. Water supply system, drainage system and wastewater treatment of "Infoxvodokanal" is involved into the project. Detailed list of objects is given in Accompanying documents 2.1-2.3.

Sources of greenhouse gases and boundaries of the baseline scenario

Activities of «Infox Ltd.» branch «Infoxvodokanal» are associated with the following GHG emissions:
• CO_2 - as a result of consumption of electric energy generated in the process of fossil fuel combustion at a thermal power plant.

Table 16. The table shows an overview of all sources of emissions in the baseline scenario

Source of emissions	Emissions	Included or excluded	Explanations
Basic emissions			
Emissions from power plants when generating electric energy for state electric energy grid	CO_2	Included	Source of emissions
	CH_4	Excluded	Is not included for reasons of simplification. Analysis is conservative
	N_2O	Excluded	Is not included for reasons of simplification. Analysis is conservative

Project's boundaries for baseline scenario are represented in black rectangle on graphic figure (Figure 14)

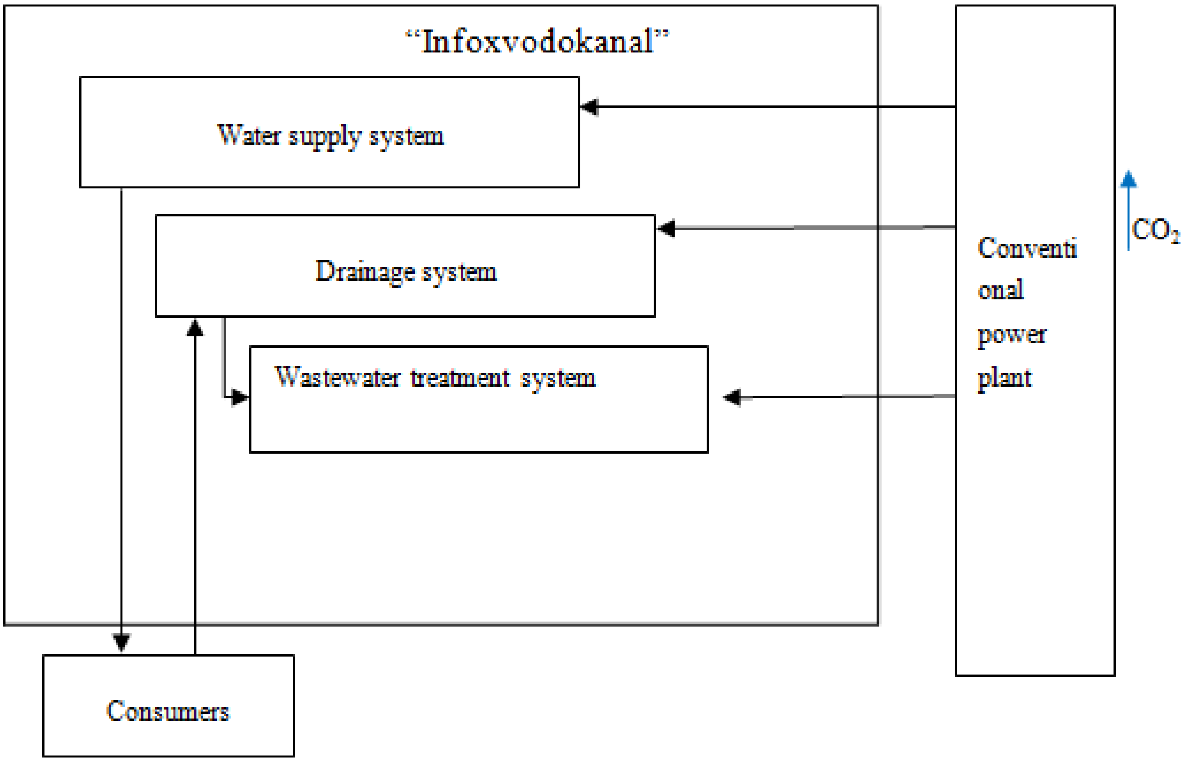

Figure 14. Project boundaries for the baseline scenario

Sources of greenhouse gases and boundaries of the project scenario:

Activities of «Infox Ltd.» branch «Infoxvodokanal» are associated with the following GHG emissions:
• CO_2 - as a result of consumption of electric energy generated in the process of fossil fuel combustion at a thermal power plant.

The following table provides an overview of sources of GHG emissions.

Table 17. The table shows an overview of all sources of emissions in the project scenario

Source of emissions	Emissions	Included or excluded	Explanations
Activity under the project			
Emissions from power plants when generating electric energy for state electric energy grid	CO_2	Included	Source of emissions
	CH_4	Excluded	Is not included for reasons of simplification. Analysis is conservative
	N_2O	Excluded	Is not included for reasons of simplification. Analysis is conservative

Project's boundaries for the project scenario are represented in black rectangle on graphic figure (Figure 15).

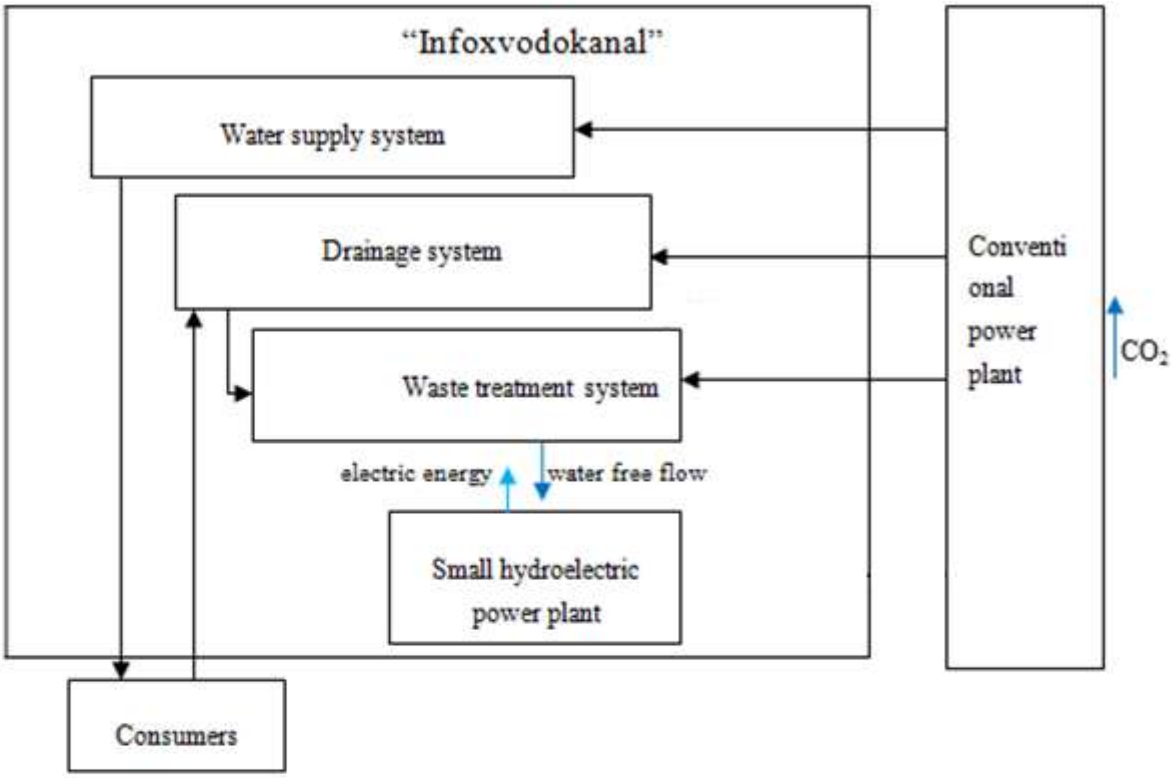

Figure 15. Project boundaries for the project scenario

Indirect extraneous leakage of CO_2, CH_4, N_2O from fuel production and its transportation are excluded. Leakages are not controlled by the project's developer (it is impossible to estimate quantity of leakages), due to this they were excluded.

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

Date of baseline determination: 31/01/2011
Baseline was determined by VEMA S.A., the project developer, and «Infox Ltd.» branch «Infoxvodokanal», the owner of the project.

VEMA S.A.:
Kyiv, Ukraine.
Fabian Knodel,
Director.
Telephone: +38 (044) 594 48 10
Fax: +38 (044) 594 48 19
e-mail: info@vemacarbon.com
VEMA S.A. is the project participant (stated in Annex 1).

«Infox Ltd.» branch «Infoxvodokanal»:
Odesa, Ukraine
Leonov Oleksiy Volodymyrovych
General director.
Telephone/Fax: +38 (048) 705 56 01
«Infox Ltd.» branch «Infoxvodokanal» is the project participant (stated in Annex 1).

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Start of project activity: 17/12/2003
17/12/2003 - «Infox» limited liability company members made a decision on the start of implementation of JI project at the company.

C.2. Expected operational lifetime of the project:

December 17, 2003 – January 31, 2017 (14 years or 168 months)
Real average life-cycle of new equipment for pumps and water-distribution networks, equipment for wastewater treatment system shall be about 30-40 years and it is confirmed by the equipment certificates. Following the principle of conservatism the life-cycle of the project shall be 14 years.

C.3. Length of the crediting period:

The date on which first emission reduction units are expected to be generated was taken as the starting date of the crediting period, namely January 1, 2004. Under the Kyoto Protocol to the UN Framework Convention on Climate Change duration of the first commitment period is 5 years (from January 1, 2008 to December 31, 2012). The end of the crediting period will be the final date of commitments to the buyer under the purchase and sales contract, under which the project owner must deliver to the buyer approved greenhouse gases anthropogenic emission reductions resulting from this project, namely December 31, 2017.

If after the first commitment period under the Kyoto Protocol its validity is prolonged, the crediting period under the project will be prolonged by 5 years/60 months until December 31, 2017.

Thus the total crediting period is from January 1, 2004 to December 31, 2017 (14 years or 168 months).

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

The choice of the baseline and monitoring is made according to requirements of Guidance on criteria for baseline setting and monitoring with consideration of Decision 9/CMP.1, Appendix «B» «Criteria for setting the baseline and monitoring”. Under the «Criteria for setting the baseline and monitoring” the project developer uses JI specific JI approach and AM0020 “Baseline methodology for water pumping efficiency improvements” (version 2) to establish monitoring. Collecting of all the key parameters necessary for calculating GHG emissions is executed in accordance with the practice, established in the “Infox Ltd.” branch “Infoxvodokanal” to measure fuel, energy, waste and environmental impact. The monitoring under the project does not require any changes in existing metering system and data collection. All relevant data is calculated and recorded in any case. All leakages were considered and calculated using the conservative approach. They were deemed to be insignificant. See Section E.2. Data of monitoring plan should be kept for at least 2 years after the end of the crediting period.

Data and parameters that are not controlled during the crediting period but are identified only once and are available at the PDD development stage:

EF_y	Specific carbon emission factor for Ukrainian electric grid, calculated by Global Carbon B.V. in «Study “Standardized emission factors for the Ukrainian electric energy grid”» (Version 5, 02 February 2007), carbon emission factors (EF) for 2003-2005 taken from Table 8, "Baseline carbon emissions for the JI projects that reduce electricity consumption" Operational guidelines for JI PDD (ERUPT 4, Senter, The Netherlands), t CO_{2e}/MW * h
EF_g	Specific carbon emission factor for Ukrainian electric grid when electric energy is generated by the small hydroelectric power plant, calculated by Global Carbon B.V. in «Study “Standardized emission factors for the Ukrainian electricity grid”» (Version 5, 02 February 2007), t CO_{2e}/MW*h

Data and parameters that are not controlled during the crediting period but are identified only once and are not available at the PDD development stage: none

Data and parameters that are controlled during the crediting period:

V_w	Volume of pumped water to consumers by the water supply system, m^3
V_m	Total volume of wastewater pumped over by the drainage system , m^3
V_t	Total volume of wastewater pumped over to the aerotank system, m^3
EC_w	Quantity of electric power, necessary for water transportation by water supply pumping plants, kW*h
EC_m	Quantity of electric power, necessary for wastewater transportation by drainage pumping plants, kW*h
EC_t	Quantity of electric power, necessary for the system of aerotanks to treat wastewater, kW*h

EC_g	Quantity of electric power generated by the small hydroelectric power plant, kW*h
BOD_t	Biological oxygen demand (BOD) in the system of aerotanks, mg/l

Table of parameters that will be included in the process of monitoring and examination for ERU calculation are given in Sections **D.1.1.1** and **D.1.1.3.**

D.1.1. Option 1 – Monitoring of the emissions in the project scenario and in the baseline scenario:

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1-M	V_w	Data of flowmeters installed at water supply pumping plants	m^3	M	Daily	Data of the company	Information will be archived in paper and electronic forms	Data which allows to calculate the GHG emissions
2-M	V_m	Data of flowmeters (volume of wastewater) installed at wastewater pumping plants	m^3	M	Daily	Data of the company	Information will be archived in paper and electronic forms	Data which allows to calculate the GHG emissions

3-M	V_t	Data of flowmeters (volume of wastewater) installed at wastewater treatment plants (“Pivnichna”, “Pivdenna”)	m^3	M	Daily	Data of the company	Information will be archived in paper and electronic forms	Data which allows to calculate the GHG emissions
4-M	EC_w	Data of electric meters installed at pumping plants	kW*h	M	Monthly	Data of the company	Information will be archived in paper and electronic forms	Data which allows to calculate the GHG emissions
5-M	EC_m	Data of flow meters installed in wastewater pumping plants	kW*h	M	Monthly	Data of the company	Information will be archived in paper and electronic forms	Data which allows to calculate the GHG emissions
6-M	EC_t	Data shown on the meters installed in wastewater treatment plants (“Pivnichna”, “Pivdenna”)	kW*h	M	Monthly	Data of the company	Information will be archived in paper and electronic forms	Data which allows to calculate the GHG emissions
7-M	EC_g	Data of electric meters installed at the small hydroelectric power plant	kW*h	M	Monthly	Data of the company	Information will be archived in paper and electronic forms	Data which allows to calculate the GHG emissions

8-M	BOD_t	Laboratory analysis of “Pivnichna” and “Pivdenna” wastewater treatment plants and (BOD_{20} concentration in the waste)	mg/l	M	Monthly	Data of the company	Information will be archived in paper and electronic forms	

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

$$E_r^y = E_{r,e}^y + E_{r,g}^y, \qquad (1)$$

Where:

E_r^y - GHG emissions that occur in period “y” in the project scenario, t CO_{2e};

$E_{r,e}^y$ - GHG emissions, due to electric energy consumption by pump and treatment equipment in period «*y*» under the project scenario, t CO_2e;

$E_{r,g}^y$ - GHG emissions, due to electric energy consumption that will be substituted with electric energy generated by small hydroelectric power plant under the project scenario, in period «*y*», *t* CO_2e;

$[e]$ - electric power demand system;

$[g]$ - small hydroelectric power plant system;

$[y]$ - monitoring period;

$[r]$ - relates to current year.

$$E_{r,e}^y = E_{r,w}^y + E_{r,m}^y + E_{r,t}^y, \qquad (2)$$

Where:

$E_{r,w}^y$ - GHG emissions, due to electric energy consumption by water supply system «*w*» in period «*y*» under the project scenario, t CO_2e;

$E^{y}_{r,m}$ - GHG emissions, due to electric energy consumption by drainage system *«m»* in period «*y*» under the project scenario, t CO_2e;
$E^{y}_{r,t}$ - GHG emissions, due to electric energy consumption by wastewater treatment system (aerotanks) *«t»* in period «*y*» under the project scenario, t CO_2e;
$[w]$ - water supply system;
$[m]$ - drainage system;
$[t]$ - aerotank system;
$[y]$ - monitoring period;
$[r]$ - relates to current year.

GHG emissions due to electric energy consumption by pump equipment, which is used by water supply system *"w"*

$$E^{y}_{r,w} = EC^{y}_{r,w} * EF_{y}, \tag{3}$$

Where:

EF_y - specific rate of carbon dioxide emissions from electric power network of Ukraine, estimated by Global Carbon B.V. in «Study "Standardized emission factors for the Ukrainian electric energy grid" (Version 5, 02 February 2007) [20];
$EC^{y}_{r,w}$ - total amount of electric energy, that is consumed by water supply system *«w»* in period «*y*» under the project scenario, kW*h.;
$[w]$ - water supply system;
$[y]$ - monitoring period;
$[r]$ - relates to current year.

GHG emissions, due to electric energy consumption which is used by drainage system *«m»*

$$E^{y}_{r,m} = EC^{y}_{r,m} * EF_{y}, \tag{4}$$

Where:

EF_y - specific rate of carbon dioxide emissions from electric power network of Ukraine, estimated by Global Carbon B.V. in «Study "Standardized emission factors for the Ukrainian electric energy grid" (Version 5, 02 February 2007);
$EC^{y}_{r,m}$ - total amount of electric energy, that is consumed by drainage system *«m»* in period «*y*» under the project scenario, kW*h.;

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[20] *Study "Standardized emission factors for the Ukrainian electric energy grid" (Version 5, 02 February 2007) developed by Global Carbon B.V.*

$[m]$ - drainage system;

$[y]$ - monitoring period;

$[r]$ - relates to project year.

GHG emissions, due to electric energy consumption which is used by wastewater treatment system (aerotanks) *«t»* in period «*y*»

$$E_{r,\,t}^{y} = EC_{r,\,t}^{y} * EF_{y}, \tag{5}$$

Where:

EF_y - specific rate of carbon dioxide emissions from electric power network of Ukraine, estimated by Global Carbon B.V. in «Study "Standardized emission factors for the Ukrainian electric energy grid" (Version 5, 02 February 2007)[21];

$EC_{r,\,t}^{y}$ - total amount of electric energy, that is consumed by aerotank system *«t»* in period «*y*» under the project scenario, kW*h.;

$[t]$ - aerotank system;

$[y]$ - monitoring period;

$[r]$ - relates to project year.

GHG emissions due to electric energy consumption which will be generated by the small hydroelectric power plant

$$E_{r,g}^{y} = EC_{r,g}^{y} * EF_{g}, \tag{6}$$

Where:

$EC_{r,g}^{y}$ - quantity of electric power generated by plant (small hydroelectric power plant), in period «y» in baseline scenario, kW*h;

EF_g - carbon emission factor for electric grid in Ukraine when generating electric energy by hydroelectric power plant, t CO_2e/MW*h;

$[g]$ - small hydroelectric power plant system;

$[y]$ - monitoring period of project scenario;

$[r]$ - relates to project monitoring period.

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[21] *Study "Standardized emission factors for the Ukrainian electric energy grid" (Version 5, 02 February 2007) developed by Global Carbon B.V.*

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1-V	$V_{r,i,w}^{y}$	Data of flowmeters installed at water pumping plants	m^3	M	Daily	Data of the company	Information will be archived in paper and electronic forms	Data which allows to calculate the GHG emissions
2-V	$V_{r,l,m}^{y}$	Data of flowmeters (volume of wastewater) installed at wastewater pumping plants	m^3	M	Daily	Data of the company	Information will be archived in paper and electronic forms	Data which allows to calculate the GHG emissions
3-V	$V_{r,c,t}^{y}$	Data of flowmeters (volume of wastewater) installed at wastewater treatment plants (“Pivnichna”, “Pivdenna”)	m^3	M	Daily	Data of the company	Information will be archived in paper and electronic forms	Data which allows to calculate the GHG emissions

4-EC	$EC^{j}_{b,\ w}$	Data of electric meters installed at water supply pumping plants	kW*h	M	Monthly	Data of the company	Information will be archived in paper and electronic forms	Data which allows to calculate the GHG emissions
5-EC	$EC^{j}_{b,\ m}$	Data of flow meters installed at wastewater pumping plants	kW*h	M	Monthly	Data of the company	Information will be archived in paper and electronic forms	Data which allows to calculate the GHG emissions
6-EC	$EC^{j}_{b,\ t}$	Data shown on the meters installed at wastewater treatment plants	kW*h	M	Monthly	Data of the company	Information will be archived in paper and electronic forms	Data which allows to calculate the GHG emissions
7-EC	$EC^{y}_{b,g}$	Data of electric meters installed at the small hydroelectric power plant	kW*h	M	Monthly	Data of the company	Information will be archived in paper and electronic forms	Data which allows to calculate the GHG emissions
8-BOD	$BOD^{j}_{b,t}$	Laboratory analysis of “Pivnichna” and “Pivdenna” wastewater treatment plants and (BOD_{20} concentration in the waste)	mg/l	M	Monthly	Data of the company	Information will be archived in paper and electronic forms	

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

$$E_b^y = E_{b,e}^y + E_{b,g}^y, \quad (7)$$

Where:

$E_{b,e}^y$ - GHG emissions that occur in period "y" in the baseline scenario, t CO_{2e};

$E_{b,e}^y$ - GHG emissions, due to electric energy consumption by pump and treatment equipment in period «*y*» under the baseline scenario, t CO_2e;

$E_{b,g}^y$ - GHG emissions, due to electric energy consumption that will be substituted with electric energy generated by the small hydroelectric power plant under the baseline scenario, in period «*y*», *t* CO_2e;

$[e]$ - electric power demand system;

$[g]$ - small hydroelectric power plant system;

$[y]$ - monitoring period;

$[b]$ - relates to the baseline period.

$$E_{b,e}^y = E_{b,w}^y + E_{b,m}^y + E_{b,t}^y, \quad (8)$$

Where:

$E_{b,w}^y$ - GHG emissions, due to electric energy consumption by water supply system *«w»* in period «*y*» under the baseline scenario, t CO_2e;

$E_{b,m}^y$ - GHG emissions, due to electric energy consumption by drainage system *«m»* in period «*y*» under the baseline scenario, t CO_2e;

$E_{b,t}^y$ - GHG emissions, due to electric energy consumption by wastewater treatment system (aerotanks) *«t»* in period «*y*» under the baseline scenario, t CO_2e;

$[e]$ - electric energy consumption system;

$[w]$ - water supply system;

$[m]$ - drainage system;

$[t]$ - aerotank system;

$[y]$ - monitoring period;

$[b]$ - relates to baseline period.

GHG emissions due to electric energy consumption by pump equipment, which is used by water supply system *"w"*

$$E_{b,w}^{y} = V_{r,w}^{y} * SEC_{b,w}^{y} * EF_{y}, \qquad (9)$$

Where:

$SEC_{b,w}^{y}$ - Specific consumption of electric energy used by water supply system "*w*" in period «*y*», in baseline scenario, kW*h./m^3;

EF_y - specific rate of carbon dioxide emissions from electric power network of Ukraine, estimated by Global Carbon B.V. in «Study "Standardized emission factors for the Ukrainian electricity grid" (Version 5, 02 February 2007) [22] carbon emission factors (EF) for 2003-2005 taken from Table 8, "Baseline carbon emissions for the JI projects that reduce electricity consumption" Operational guidelines for JI PDD (ERUPT 4, Senter, The Netherlands);

$V_{r,w}^{y}$ - total volume of water pumped by water supply system «w» in period "y", in baseline scenario, m^3;

$[w]$ - water supply system;

$[y]$ - monitoring period;

$[b]$ - relates to baseline period;

$[r]$ - relates to project period.

Specific electric energy consumption in the baseline scenario is calculated based on the assumption of its linear growth with time. This linear dependence is based on historical data for the period of 2000-2003 using the method of least squares. Specific electric energy consumption in the baseline scenario in year "y" is calculated according to formulae:

$$SEC_{b,w}^{y} = a \cdot y + b, \qquad (9.1)$$

[22] *Study "Standardized emission factors for the Ukrainian electric energy grid" (Version 5, 02 February 2007) developed by Global Carbon B.V.*

$$a = \frac{4\sum_j (SEC^j_{b,w} \cdot j) - \sum_j SEC^j_{b,w} \cdot \sum_j j}{4\sum_j j^2 - (\sum_j j)^2} , \qquad (9.2)$$

$$b = \frac{\sum_j SEC^j_{b,w} - a \cdot \sum_j j}{4} , \qquad (9.3)$$

Where:

$SEC^y_{b,\,w}$ - Specific consumption of electric energy used by water supply system “*w*” in period «*y*», in baseline scenario, kW*h./m^3;

a - linear dependence coefficient;

b - linear dependence coefficient;

$[w]$ - water supply system;

$[j]$ - historical period $j \in \{2000, 2001, 2002, 2003\}$;

$[4]$ - number of years in historical period;

$[y]$ - monitoring period;

$[b]$ - relates to baseline period.

In this formula specific consumption in year «*j*» is calculated as follows:

$$SEC^j_{b,\,w} = EC^j_{b,\,w} / V^j_{b,\,w}, \qquad (9.4)$$

Where:

$EC^j_{b,\,w}$ - total quantity of electric power, used by water supply system “*w*” in period “*j*” in baseline scenario, kW*h;

$V^j_{b,\,w}$ - total volume of water pumped by water supply system «*w*» in period “y”, in baseline scenario, m^3;

$[w]$ - water supply system;

$[j]$ - historical period $j \in \{2000, 2001, 2002, 2003\}$;

$[b]$ - relates to baseline period.

GHG emissions, due to electric energy consumption which is used by drainage system *«m»*

$$E_{b,m}^{y} = V_{r,m}^{y} * SEC_{b,m}^{y} * EF_{y} \ , \qquad (10)$$

Where:

$SEC_{b,\ m}^{y}$ - Specific consumption of electric energy used by drainage system "*m*" in period «*y*», in baseline scenario, kW*h./m^3;

EF_{y} - specific rate of carbon dioxide emissions from electric power network of Ukraine, estimated by Global Carbon B.V. in «Study "Standardized emission factors for the Ukrainian electricity grid" (Version 5, 02 February 2007), carbon emission factors (EF) for 2003-2005 taken from Table 8, "Baseline carbon emissions for the JI projects that reduce electricity consumption" Operational guidelines for JI PDD (ERUPT 4, Senter, The Netherlands);

$V_{r,\ m}^{y}$ - total volume of wastewater pumped by drainage system *«m»* in period "*y*", m^3;

$[m]$ - drainage system;

$[y]$ - monitoring period;

$[b]$ - relates to baseline period;

$[r]$ - relates to project period.

Specific electric energy consumption in the baseline scenario is calculated based on the assumption of its linear growth with time. This linear dependence is based on historical data for the period of 2001-2004 using the method of least squares. Specific electric energy consumption in the baseline scenario in year "y" is calculated according to formulae:

$$SEC_{b,\ m}^{y} = a \cdot y + b,$$

$$a = \frac{4\sum_j (SEC^j_{b,m} \cdot j) - \sum_j SEC^j_{b,m} \cdot \sum_j j}{4\sum_j j^2 - (\sum_j j)^2}, \qquad (10.1)$$

$$b = \frac{\sum_j SEC^j_{b,m} - a \cdot \sum_j j}{4}, \qquad (10.2)$$

Where:

$SEC^y_{b,\,m}$ - Specific consumption of electric energy used by drainage system "*m*" in period «*y*», in the baseline scenario, kW*h./m^3;

a - linear dependence coefficient;

b - linear dependence coefficient ;

$[m]$ - sludge discharge on sludge fields system;

$[j]$ - historical period $j \in \{2001, 2002, 2003, 2004\}$;

$[4]$ - number of years in historical period;

$[y]$ - monitoring period of project scenario;

$[b]$ - relates to baseline period.

In this formula specific consumption in year «*j*» is calculated as:

$$SEC^j_{b,\,m} = EC^j_{b,\,m} / V^j_{b,\,m}, \qquad (10.3)$$

Where:

$EC^j_{b,\,m}$ - total quantity of electric power, used by drainage system "*m*" in period "*j*", kW*h;

$V^j_{b,\,m}$ - total volume of wastewater pumped by drainage system «*m*» in period "*y*", m^3;

$[m]$ - drainage system;

$[j]$ - historical period $j \in \{2001, 2002, 2003, 2004\}$;

$[b]$ - relates to baseline period.

GHG emissions, due to electric energy consumption which is used by wastewater treatment system (aerotanks) *«t»* in period *«y»*

$$E_{b,t}^{y} = V_{r,t}^{y} * SEC_{b,t}^{y} * EF_{y}, \tag{11}$$

Where:

$SEC_{b,t}^{y}$ - Specific consumption of electric energy used by system of aerotanks "t" in period «*y*», in baseline scenario, kW*h./m^3;

EF_{y} - specific rate of carbon dioxide emissions from electric power network of Ukraine, estimated by Global Carbon B.V. in «Study "Standardized emission factors for the Ukrainian electricity grid" (Version 5, 02 February 2007), carbon emission factors (EF) for 2003-2005 taken from Table 8, "Baseline carbon emissions for the JI projects that reduce electricity consumption" Operational guidelines for JI PDD (ERUPT 4, Senter, The Netherlands);

$V_{r,t}^{y}$ - total volume of wastewater treated by system of aerotanks *«t»* in period "*y*", m^3;

$[t]$ - system of aerotanks;

$[y]$ - monitoring period;

$[b]$ - relates to baseline period;

$[r]$ - relates to project period.

Specific electric energy consumption in the baseline scenario is calculated based on the assumption of its linear growth with time. This linear dependence is based on historical data for the period of 2000-2003 using the method of least squares. Specific electric energy consumption in the baseline scenario in year "y" is calculated according to formulae:

$$SEC_{b,t}^{y} = a \cdot y + b, \tag{11.1}$$

$$a = \frac{4\sum_{j}(SEC_{b,t}^{j} \cdot j) - \sum_{j} SEC_{b,t}^{j} \cdot \sum_{j} j}{4\sum_{j} j^{2} - (\sum_{j} j)^{2}}, \tag{11.2}$$

$$b = \frac{\sum_j SEC_{b,t}^j - a \cdot \sum_j j}{4}, \qquad (11.3)$$

Where:

$SEC_{b,t}^y$ - Specific consumption of electric energy used by system of aerotanks "t" in period «*y*», in the baseline scenario, kW*h./m^3;

a - linear dependence coefficient;

b - linear dependence coefficient;

$[t]$ - system of aerotanks;

$[j]$ - historical period $j \in \{2000, 2001, 2002, 2003\}$;

$[4]$ - number of years in historical period;

$[y]$ - monitoring period of project scenario;

$[b]$ - relates to baseline period.

In this formula specific consumption in year «*j*» is calculated as follows:

$$SEC_{b,t}^j = EC_{b,t}^j \,/\, (V_{b,t}^j * BOD_{b,t}^j \,/\, 100000), \qquad (11.4)$$

Where:

$EC_{b,t}^j$ - total quantity of electric power, used by system of aerotanks *"t"* in period "*j*", kW*h;

$BOD_{b,t}^j$ -biological oxygen demand (BOD_{20}) in the system of aerotanks *"t"* in the period *"j"*, mg/l;

$V_{b,t}^j$ - total volume of wastewater treated by system of aerotanks *«t»* in period "*y*", m^3;

$[t]$ - system of aerotanks;

$[j]$ - historical period $j \in \{2000, 2001, 2002, 2003\}$;

$[b]$ - relates to baseline period;

GHG emissions due to electric energy consumption which will be generated by the small hydroelectric power plant under the baseline scenario

$$E_{b,g}^{y} = EC_{b,g}^{y} * EF_{g}, \qquad (12)$$

Where:

$EC_{b,g}^{y}$ - quantity of electric power generated by a plant (the small hydroelectric power plant), in period «y» in baseline scenario, kW*h;

EF_{g} - carbon emission factor for electrical grid in Ukraine when generating electric energy by hydroelectric power plant, t CO_2e/MW*h;

$[g]$ - small hydroelectric power plant system;

$[y]$ - monitoring period of project scenario;

$[b]$ - relates to baseline monitoring period.

Data/Parameter	$EC_{b,w}^{j}$	
Data unit	kW*h	
Description	Total volume of electric power, necessary for water transportation to consumers in water supply system *«w»* in period	
Time of determination/monitoring	Determined before the beginning of the project in 2001-2003 basic years	
Source of data (to be) used	Data of electric meters installed at pumping plants	
Value of data applied (for ex ante calculations/determinations)	Year	$EC_{b,w}^{j}$
	2000	48962000
	2001	46304000
	2002	38840000
	2003	40283000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0020 (version 02)	
QA/QC procedures (to be)	Measurements are performed by regularly calibrated meters.	

applied	
Any comment	Data which allows to calculate the GHG emissions in the project period, information will be archived in paper and electronic forms.

Data/Parameter	$EC_{b,\,m}^{j}$
Data unit	kW*h
Description	Total volume of electric power, necessary for wastewater transportation in drainage system *«m»* by lift plant in the period
Time of determination/monitoring	Determined before the beginning of the project in 2001-2004 basic years
Source of data (to be) used	Data of flow meters installed in wastewater pumping plants
Value of data applied (for ex ante calculations/determinations)	Year / $EC_{b,m}^{j}$: 2001 — 36487890 2002 — 36205000 2003 — 41203000 2004 — 38378000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Consumption of electrical energy is determined with the help of electric meters
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data which allows to calculate the GHG emissions in the project period, information will be archived in paper and electronic forms.

Data/Parameter	$EC_{b,\,t}^{j}$
Data unit	kW*h
Description	Total volume of electric power, used by system of aerotanks «t» in the period
Time of determination/monitoring	Determined before the beginning of the project in 2000-2003 basic years

Source of data (to be) used	Data shown on the meters installed in wastewater treatment plants (“Pivnichna”, “Pivdenna”)
Value of data applied (for ex ante calculations/determinations)	Year / $EC^{j}_{b,t}$: 2000 – 26179670 2001 – 25835000 2002 – 24595000 2003 – 24077000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Consumption of electrical energy is determined with the help of electric meters
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data which allows to calculate the GHG emissions in the project period, information will be archived in paper and electronic forms.

Year	$EC^{j}_{b,t}$
2000	26179670
2001	25835000
2002	24595000
2003	24077000

Data/Parameter	$EC^{y}_{b,g}$
Data unit	kW*h
Description	Total volume of electric power, to be substituted with electric energy generated by the small hydroelectric power plant
Time of determination/monitoring	Determined before the beginning of the project in 2011 basic year
Source of data (to be) used	Data of electric meters installed in wastewater treatment plants
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Consumption of electrical energy is determined with the help of electric meters
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data which allows to calculate the GHG emissions in the project year, information will be archived in paper and electronic forms.

Data/Parameter	$V_{b,w}^{j}$
Data unit	m^3
Description	Total volume of pumped water to consumers by water supply system *«w»* in the period
Time of determination/monitoring	Determined before the beginning of the project in 2001-2003 basic years
Source of data (to be) used	Data of flowmeters installed at lifting plants
Value of data applied (for ex ante calculations/determinations)	Year: 2000 — 199898300; 2001 — 199698000; 2002 — 162043000; 2003 — 131501000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0020 (version 02)
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data which allows to calculate the GHG emissions under the baseline scenario, information will be archived in paper and electronic forms.

Value of data applied:

Year	$V_{b,w}^{j}$
2000	199898300
2001	199698000
2002	162043000
2003	131501000

Data/Parameter	$V_{b,m}^{j}$
Data unit	m^3
Description	Total volume of wastewater pumped over by drainage system *«m»* in the period
Time of determination/monitoring	Determined before the beginning of the project in 2001-2004 basic years
Source of data (to be) used	Data of flowmeters (volume of wastewater) installed at wastewater pumping plants

Value of data applied (for ex ante calculations/determinations)	Year: $V_{b,m}^{j}$ 2001: 139373000 2002: 135411000 2003: 133228000 2004: 121658000
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Data of the company
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data which allows to calculate the GHG emissions under the baseline scenario, information will be archived in paper and electronic forms.

Data/Parameter	$V_{b,t}^{j}$
Data unit	m^3
Description	Total volume of wastewater pumped over to the system of aerotanks *«t»* in the period
Time of determination/monitoring	Determined before the beginning of the project in 2000-2003 basic years
Source of data (to be) used	Data of flowmeters (volume of wastewater) installed at wastewater treatment plants ("Pivnichna", "Pivdenna") and laboratory analysis (concentration of BOD in wastewaters)
Value of data applied (for ex ante calculations/determinations)	Year: $V_{b,t}^{j}$ 2000: 139373410 2001: 139373000 2002: 135411000 2003: 133228000
Justification of the choice of data or description of measurement methods and	Data of the company

procedures (to be) applied	
QA/QC procedures (to be) applied	Measurements are performed by regularly calibrated meters.
Any comment	Data which allows to calculate the GHG emissions under the baseline scenario, information will be archived in paper and electronic forms.

Data/Parameter	$BOD_{b,t}^{j}$
Data unit	mg/l
Description	Biological oxygen demand (BOD_{20}) in the system of aerotanks "*t*" in the period.
Time of determination/monitoring	Determined at the beginning of the project in the baseline 2000-2003 years
Source of data (to be) used	Laboratory analysis of "Pivnichna" and "Pivdenna" wastewater treatment plants and (BOD_{20} concentration in the waste)
Value of data applied (for ex ante calculations/determinations)	Year / $BOD_{b,t}^{j}$ «Pivnichna» / $BOD_{b,t}^{j}$ «Pivdenna»: 2000: 135,20 / 83,50 2001: 135,10 / 84,00 2002: 133,30 / 82,50 2003: 129,70 / 62,20
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Data of the company
QA/QC procedures (to be) applied	Chemical and biological analysis of company laboratories
Any comment	Data which allows to calculate the GHG emissions under the baseline scenario, information will be archived in paper and electronic forms.

Year	$BOD_{b,t}^{j}$ «Pivnichna»	$BOD_{b,t}^{j}$ «Pivdenna»
2000	135,20	83,50
2001	135,10	84,00
2002	133,30	82,50
2003	129,70	62,20

D. 1.2. Option 2 – Direct monitoring of emission reductions from the project (values should be consistent with those in section E.):

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

N/A

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

N/A

D.1.3. Estimation of leakage in the monitoring plan:

There are no leakages. Dynamic baseline (based on data collected for monitoring) excludes all possible leakages.

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

No leakage is expected.

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO_2 equivalent):

No leakage is expected.

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

Number of Emission Reduction (ER) Units, t CO_2e:

$$ER^{y} = E_{b}^{y} - E_{r}^{y}, \qquad (13)$$

where:

ER^{y} - amount of emission reduction units, t CO_{2e};

E_{b}^{y} – GHG emissions in period «*y*» under the baseline scenario, t CO_2e;

E_{r}^{y} – GHG emissions in period «*y*» under the project scenario, t CO_2e;

$[y]$ - monitoring period;

$[b]$ - relates to baseline period;

$[r]$ - relates to project period.

D.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

Major environmental law of Ukraine:
Law of Ukraine "On environmental protection"[23].
According to the environmental section "Evaluation of Environmental Impact" (EIA) of the project that will be provided during the implementation of the small hydroelectric power plant, emissions caused by the operation of this equipment should be measured once every 2 years (the " Proposal for establishing maximum permissible emissions" section). "Infox Ltd." branch "Infoxvodokanal" will systematically collect data on pollution, which may have a negative impact on the environment. Skilled workers of "Infox Ltd." branch "Infoxvodokanal" will be engaged in monitoring, data collection meters (electric meters, flowmeters) and archiving. All data must be kept for two years after the transfer of emission reduction units generated by the project.

[23] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1264-12

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1-M, 2-M, 3-M	Low	Meters shall be calibrated according to the national standards by appropriate body "ALTAR-INFOXVODOKANAL"
4-M, 5-M, 6-M, 7-M	Low	Meters shall be calibrated according to the national standards by appropriate body "ALTAR-INFOXVODOKANAL"
8-M	Low	Chemical and biological analysis of "Pivnichna" and "Pivdenna" wastewater treatment plants laboratories

D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan:

Operational structure includes Supplier's («Infox Ltd.» branch «Infoxvodokanal») operational departments (repair-and-renewal operations, etc.) and personnel for pumping plants exploitation.
Management structure includes administration department s of the Supplier and project's specialists-developers (VEMA S.A.).
Detailed operational structure and management structure is give in the Annex 3.

D.4. Name of person(s)/entity(ies) establishing the monitoring plan:

Monitoring plan is determined by VEMA S.A., project's developer, and «Infox Ltd.» branch «Infoxvodokanal», supplier of the project.
VEMA S.A.:
Kyiv, Ukraine
Telephone: +38 (044) 206 84 43
Fax: +38 (044) 206 84 43
e-mail: asb@vemacarbon.com
VEMA S.A is a project participant (Annex 1)

«Infox Ltd.» branch «Infoxvodokanal»:
Ukraine, 65039, Odesa, Baseyna str. 5
Leonov Oleksiy Volodymyrovych
General director.
Telephone/Fax: 38 (048) 728-41-01
«Infox Ltd.» branch «Infoxvodokanal» is a project participant (Annex 1).

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Since it is impossible to apply methodological calculations described in Section D (Project monitoring plan) for preliminary estimation of project emission reduction, specific formulae were elaborated and used for preliminary estimation of project emission reductions, stated in Accompanying document 1. Since in the course of project's elaboration volume of supplied water, treated wastewater, treated sludge and consumed electric energy are unknown, the project's developers rely on the data known at this stage of calculation, namely basic volume of supplied water, basic volume of drained wastewater, basic volume of treated wastewater, and total quantity of consumed electric energy, efficiency factor of the pumping plant.
Results of corresponding calculations with application of these formulae are given in Accompanying documents 1, 2.1-2.3. These calculations are based on improvement of equipment efficiency. Identification of parameters corresponding to these formulae is stated in Accompanying documents 1, 2.1-2.3.

Each accompanying document contains calculation of GHG emission reductions corresponding to certain technology applied in the JI project:
Accompanying document 1 – Calculation of estimated greenhouse gases emissions.
Replacement of old pumps with low efficiency factor by new high-effective ones; transfer of load from the pumps with worn-out equipment to the pumps with high-effective equipment.
Accompanying document 2.1. – Replacement and modernization of pumping plants of water supply system.
Accompanying document 2.2. - Replacement and modernization of pumping plants of drainage system.
Accompanying document 2.3. – Replacement and modernization of pumping plants and equipment of wastewater treatment system.
Accompanying document 3 – metering equipment installed at facilities included in the project boundaries.

GHG emission reductions were estimated in the project by means of the following formulae (See Accompanying document 1).

Table 19. Estimated project emissions for the period from January 1, 2004 to December 31, 2012

Year	Project emissions (tCO_2 equivalent)
2004	141 061
2005	155 148
2006	142 967
2007	125 675
2008	99 967
2009	86 150
2010	74 269
2011	63 566
2012	60 450
Total (t CO_2 equivalent)	949 252

Table 20. Estimated project emissions for the period from January 1, 2013 to December 31, 2017

Year	Project emissions (tCO_2 equivalent)
2013	60 450
2014	60 450

2015	60 450
2016	60 450
2017	60 450
Total (t CO_2 equivalent)	302 248

Detailed information on calculations is given in the Accompanying document 1, 2.1.-2.3.

E.2. Estimated leakage:

There are no expected leakages.

E.3. Sum E.1 and E.2.:

Since there are no leakages the sum E.1 and E.2 will be equal to E.1 (see Tables 21-27).

E.4. Estimated baseline emissions:

For preliminary estimation of project emission reductions specific formulae stated in Accompanying document 1 were elaborated and applied.

Table 21. Estimated baseline emissions for the period from January 1, 2004 to December 31, 2012

Year	Expected baseline emissions (tCO_2 equivalent)
2004	181 239
2005	227 577
2006	236 602
2007	242 169
2008	251 824
2009	252 661
2010	252 930
2011	256 026
2012	256 026
Total (t CO_2 equivalent)	2 157 054

Table 22. Estimated baseline emissions for the period from January 1, 2013 to December 31, 2017

Year	Expected baseline emissions (tCO_2 equivalent)
2013	256 026
2014	256 026
2015	256 026
2016	256 026
2017	256 026
Total (t CO_2 equivalent)	1 280 128

E.5. Difference between E.4. and E.3. representing the emission reductions of the project:

Project emission reductions = Baseline emissions - (Project emissions + Estimated leakages).
All results of estimation of project emission reductions are given in Tables 23-24.

Table 23. Estimated emission reductions for the period from January 1, 2004 to December 31, 2012

Year	Expected emission reductions (t CO_2 equivalent)
2004	40 178
2005	72 429
2006	93 636
2007	116 495
2008	151 856
2009	166 511
2010	178 661
2011	192 459
2012	195 576
Total (t CO_2 equivalent)	1 207 802

Table 24. Estimated emission reductions for the period from January 1, 2013 to December 31, 2017

Year	Expected emission reductions (t CO_2 equivalent)
2013	195 576
2014	195 576
2015	195 576
2016	195 576
2017	195 576
Total (t CO_2 equivalent)	977 881

E.6. Table providing values obtained when applying formulae above:

Table. 25. Table providing results of emission reduction estimation before the first commitment period.

Year	Expected project emissions (t CO_2 equivalent)	Expected leakages (t CO_2 equivalent)	Expected baseline emissions (t CO_2 equivalent)	Expected emission reductions (t CO_2 equivalent)
2004	141 061	0	181 239	40 178
2005	155 148	0	227 577	72 429
2006	142 967	0	236 602	93 636
2007	125 675	0	242 169	116 495
Total (t CO_2 equivalent)	564 850	0	887 589	322 738

Table. 26. Table providing results of emission reduction estimation during the first commitment period.

Year	Expected project emissions (t CO_2 equivalent)	Expected leakages (t CO_2 equivalent)	Expected baseline emissions (t CO_2 equivalent)	Expected emission reductions (t CO_2 equivalent)
2008	99 967	0	251 824	151 856
2009	86 150	0	252 661	166 511
2010	74 269	0	252 930	178 661
2011	63 566	0	256 026	192 459
2012	60 450	0	256 026	195 576
Total (t CO_2 equivalent)	384 402	0	1 269 465	885 063

Table. 27. Table providing results of emission reduction estimation after the first commitment period.

Year	Expected project emissions (t CO_2 equivalent)	Expected leakages (t CO_2 equivalent)	Expected baseline emissions (t CO_2 equivalent)	Expected emission reductions (t CO_2 equivalent)
2013	60 450	0	256 026	195 576
2014	60 450	0	256 026	195 576
2015	60 450	0	256 026	195 576
2016	60 450	0	256 026	195 576
2017	60 450	0	256 026	195 576
Total (t CO_2 equivalent)	302 248	0	1 280 128	977 881

SECTION F. Environmental Impacts

F.1. Documentation regarding analysis of project impact on the environment, including transboundary impacts, in accordance with procedures required by the host Party.

Modernization of pumping plants, replacing of water supply and drainage systems are not the objects of particular environmental hazard and are not subject to state examination in accordance with Resolution # 554 as of July 27, 1995 "A list of activities and objects of high environmental hazard"[24] and Art.. 14 of the Law of Ukraine "On ecological expertise"[25].

Project documentation for the implementation of the small hydroelectric power plant (according to state building codes of Ukraine A.2.2-1-2003), which includes environmental impact assessment (EIA) is under development and will be provided during the implementation period.

“Infox Ltd." branch "Infoxvodokanal” has all permits, including limits on the formation and disposal of waste, as well as relevant standards in processing reporting documents on the use of energy resources:

- Permits for special water use;
- Permits for waste disposal "Dniester" WTP;
- Permits for waste disposal "Miskanalizatsiya” (Municipal sewage);
- Permits for waste disposal “Pivnichna” BTP;
- Permits for waste disposal “Pivdenna” BTP;
- The limit on the formation and disposal of waste “Infox Ltd.”;
- Form 2-TP (VODHOSP), report on water use;
- Form 1911 MTP, report on the use of fuel, heat and electricity;
- Balance MAD (of maximum allowable discharges).

Generally the project «Development and improvement of water supply system, drainage system and wastewater treatment of «Infox Ltd.» branch «Infoxvodokanal» will have favorable impact on the environment. It is expected that due to decrease in network energy usage by water-supply system, drainage system, wastewater system (mainly because of pumping equipment) the emission of CO_2 from the national power grid of Ukraine will decrease.

Environmental effect will be caused only by dismantled equipment. It is a state property and it will further be stored at the company’s warehouses.

Water environment effect

Implementation of the project will have favorable effect. It will allow for the decrease of water usage as a result it will decrease the volumes of discharged wastewater. The decrease of water usage will be achieved due to distribution network replacement that in turn will lower water leakages in the network. The decrease in wastewater leakage will be achieved due to network modernization and replacement that in turn will lower the quantity of breakdowns and the quantity of emergency sections. Improvement of wastewater treatment system will improve the quality of treated wastewater, which will improve the environmental situation in the Black Sea.

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[24] *http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=554-95-%EF*

[25] *http://www.ic-chernobyl.kiev.ua/nd/zu/z_45.htm*

Atmosphere environment effect

Atmosphere environment effect is absent.

Land use effect

Land/soil use effect is absent.

Environmental effect

Implementation of this project will allow for improvement of level of service for water consumers. Experience of «Infoxvodokanal» branch staff and compliance with regulations on «Drinking water and drinking water supply» will allow for minimization of risks of any accidents during the project implementation.

Transboundary impacts from the project activity according to their definition in the text of "Convention on transboundary long-range pollution", ratified by Ukraine, will not take place.

The Project does not assume any detrimental effects on the environment.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to supporting documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

As mentioned above, when analyzing environmental impact it is clear that the project does not make any significant negative environmental impact, but rather has a positive effect on the environment. It is expected that due to decrease in energy usage from the national power grid of Ukraine by water-supply system, drainage system, wastewater system (mainly because of pumping equipment) the emission of CO_2 will decrease.

РОЗДІЛ G. Stakeholders' comments

G.1. Information on stakeholders' comments on the project, as appropriate:

Since the project activities do not imply any negative environmental impact and negative social effect, special public discussions were not necessary. However, "Infox Ltd." branch "Infoxvodokanal" constantly informs the public about the implementations and modernization that are implemented or planned to be implemented, and the stages of their implementation at the official website of the company[26]. Stakeholders may provide their comments and take part in the discussion of these issues. No comments have been received from the Stakeholders so far.

[26] *http://www.infox.ua/projects/infoxvodokanal/*

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation	Ltd. “Infox” branch “Infoxvodokanal”
Street/P.O.Box	Baseyna st.
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City	Odesa
State/Region	Odesa region
Postal code	65039
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Phone	+38 (048) 705 56 01
Fax	+38 (048) 705 56 01
E-mail	
Website	
Represented by	
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Salutation	
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First name	Oleksiy
Middle name	Volodymyrovych
Department	
Fax (direct)	
Phone (direct)	+38 (048) 728 41 01
Cell phone	+38 (048) 728 41 01
Personal e-mail	

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City	Geneva
State/Region	
Postal code	PC 170 CH-1222
Country	Switzerland
Phone	+38 (044) 594 48 10
Fax	+38 (044) 594 48 19
E-mail	info@vemacarbon.com
Website	www.vemacarbon.com
Represented by	
Title	director
Salutation	
Last name	Knodel
First name	Fabian
Middle name	
Department	
Fax (direct)	
Phone (direct)	+38 (044) 594 48 10
Cell phone	
Personal e-mail	

Annex 2

BASELINE INFORMATION

Key information for baseline determination is stated in the tables given in section B.2.

Data and parameters which do not require monitoring

Table 28. Data and parameters which do not require monitoring

Parameter	Data unit	Data source	Desription
EF_y	t CO_2e/MW*h	Research data of Global Carbon B.V.	Carbon emission factor for Ukrainian electrical grid for each commitment period. The first period of commitments is 2004-2012
EF_g	t CO_2e/MW*h	Research data of Global Carbon B.V.	Carbon emission factor for Ukrainian electrical grid for each commitment period. The first period of commitments is 2004-2012

Annex 3

MONITORING PLAN

Detailed information about the monitoring may be considered in the following way:

A. Technical description of the project

Arrangements implemented for increase in efficiency of Branch "Infoxvodokanal" consist in the following:

1. Old pumps characterized by low efficiency will be replaced by the pumps with the efficiency of 81-89%. Modernization or replacement of the equipment at pumping plants will be fixed in the acts of commissioning and documentation confirming purchase and assembly of new equipment;
2. Optimization of the water pumping technological process. Transfer of workload from pumping plants with old equipment to the pumping plants with high-efficiency equipment. Monitoring will be carried out by means of provision of a detailed layout of the water-supply network pipelines subject to marking of main diameters of the pipeline;
3. Introduction of automatic air valves on water mains for decrease of pressure and improvement of water and wastewater plant capacity. Monitoring of new equipment implementation will be carried out by means of the documentation confirming purchase and assembly of new equipment;
4. Replacement of water-supply networks. Modernization or replacement of pipes will be fixed in the acts of commissioning;
5. Installation of a new group of metering devices. Monitoring of new equipment introduction will be conducted by means of the documentation confirming purchase and assembly of new equipment;
6. Installation of frequency regulators. Monitoring of new equipment introduction will be conducted by means of the documentation confirming purchase and assembly of new equipment;
7. Modernization and replacement of aeration system. Monitoring of new equipment introduction will be conducted by means of the documentation confirming purchase and assembly of new equipment; modernization of old equipment – by acts of commissioning .
8. Installation of the small hydroelectric power plant. Monitoring of new equipment introduction will be conducted by means of the documentation confirming purchase and assembly of new equipment.

Documentation confirming purchase and assembly of new equipment will be archived and kept at «Infox Ltd.» branch «Infoxvodokanal» during two years after delivery of emission reduction units generated by the project.

B. Control of monitoring organization

Structure of monitoring data collection is the following:

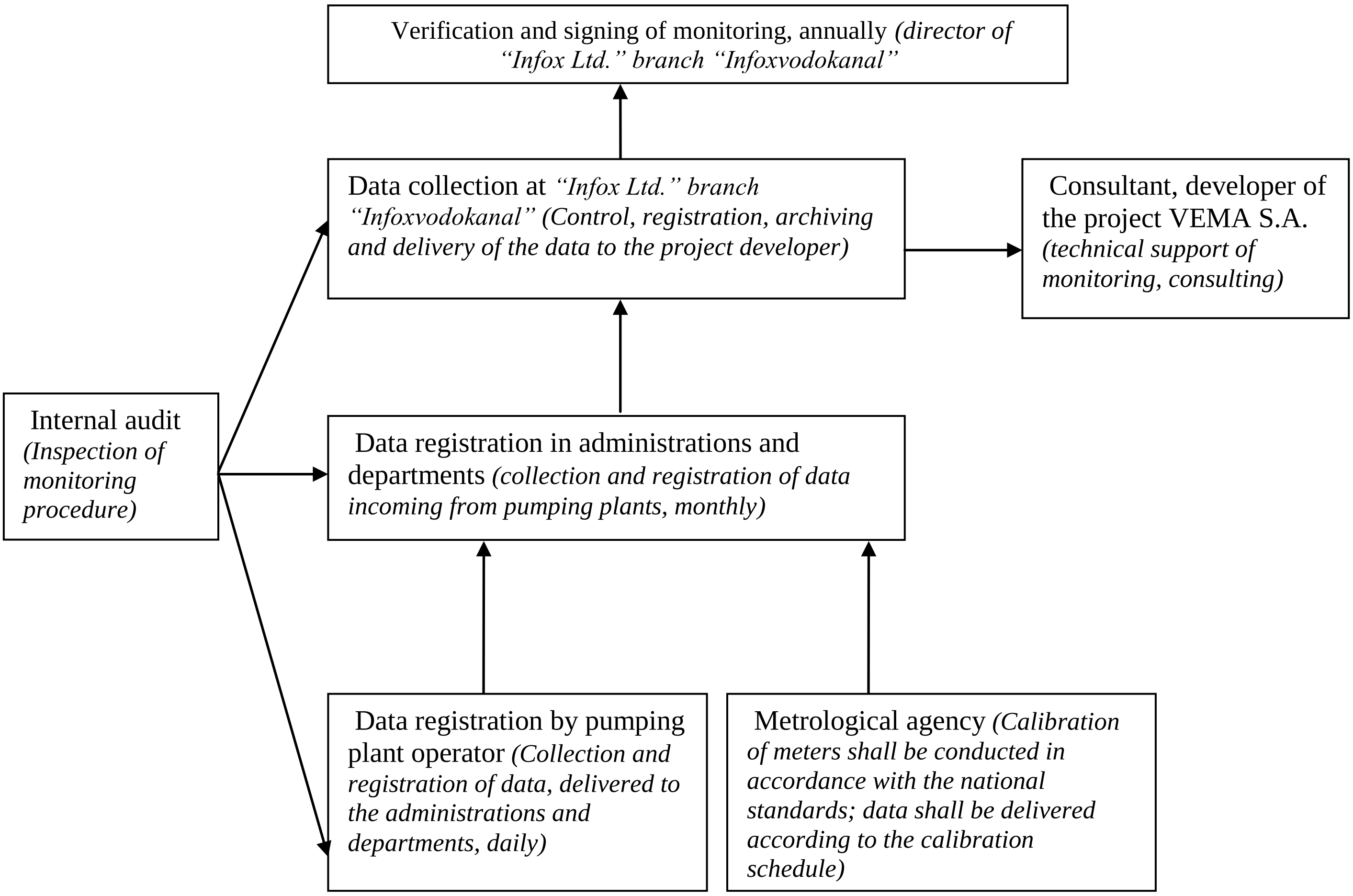

Figure 16. Structure of data collectionof monitoring at "Infox Ltd." branch "Infoxvodokanal"

C. Monitoring procedures

Measures for control of electric energy, consumed by "Infox Ltd." branch "Infoxvodokanal":

1. Current control of electric energy meters operation is conducted during settling period (settling month is determined by the conditions of the contract on electric energy supply);

2. On the day stipulated by the contract (as a rule it is 00 hours 00 minutes on the 1st day of month following the settling month) the chief of site or his authorized representative shall take the readings of electric energy meters (electric energy meters are the devices, which passed state certification, registered under contractual conditions and jointly sealed by the representatives of power supplying organization and "Infox Ltd." branch "Infoxvodokanal" subject to execution of act of sealing). The head of site shall transfer obtained information to the chief power engineer department;

3. "Report on electric energy meters readings" shall be made according to the readings of electric energy meters of all sites; engineer involved in electric energy bills shall provide this Report to the subscriber department of energy supplying organization;

4. Following the "Report on electric energy meters readings" subscriber department of energy supplying organization shall make the "Act of supplied electric energy", approved by the company's round seal and hand it over to the department of "Infox Ltd." branch "Infoxvodokanal" for confirmation;

5. The representative of "Infox Ltd." branch "Infoxvodokanal" shall provide approved "Act of supplied electric energy" to the subscriber department of energy supplying organization, wherein he obtains invoices for payment;

6. All payment receipts shall be kept by "Infox Ltd." branch "Infoxvodokanal" in paper form.

Measures for control of supplied water to the consumers at "Infox Ltd." branch "Infoxvodokanal":

1. Metering of water produced from water facilities of "Infox Ltd." branch "Infoxvodokanal" shall be carried out by flow meters located at pumping plants when intaking thereof from the Dniester river-bed ("Dniester" WTP);

2. Data shall be taken every hour and fixed in logs of established form PID-11;

3. Data about volume of water lifted from the second lifting plant for previous twenty-four hours shall be transferred every day at 00:00 o'clock to control department of each production unit;

4. Persons responsible for statistical reporting under the form 2-TP (vodhosp) shall draw up the fact sheets on the basis of dispatching record of taken water before 10th day of every month that are transferred to corresponding services of management personnel of "Infox Ltd." branch "Infoxvodokanal";

5. Report 2-TP (vodhosp) shall be submitted to the Odesa Department of Water Resources after its verification by production-technical department and sales department of management personnel. Payment for water, supplied to consumer, shall be made according to this report.

Measures for drained wastewater from consumers control at “Infox Ltd.” branch “Infoxvodokanal”:

1. 1. Metering of drained wastewaters in the drainage system of “Infox Ltd.” branch “Infoxvodokanal” is carried out by means of flowmeters located at wastewater pumping plants of wastewater pumping facilities at the entrance to biological treatment plants “Pivnichna” and “Pivdenna”. As the volume of waste water after wastewater pumping stations is equal to the volume of waste water that enters wastewater treatment facilities, it was decided to install flow meters only at the entrance of BTP (biological treatment plant) “Pivnichna” and “Pivdenna” that track the overall volume of wastewater only once. That is $V_m = V_t$;
2. Data is taken every hour and fixed in logs of established form PID-11;
3. Data about volume of water lifted from the second lifting plant for previous twenty-four hours shall be transferred every day at 00:00 o’clock to the monitoring service department of each production unit;
4. Persons responsible for statistical reporting under the form 2-TP (vodhosp) shall draw up the fact sheets on the basis of dispatching record of drained wastewater before 10^{th} day of every month that are transferred to corresponding services of management apparatus of “Infox Ltd.” branch “Infoxvodokanal”;
5. Report 2-TP (vodhosp) shall be submitted to the Odesa Department of Water Resources after its verification by production-technical department and sales department of management apparatus on a quarterly basis. Payment for drained wastewater from consumers, shall be made according to this report.

Measures for wastewater drained by “Pivnichna”, “Pivdenna” wastewater treatment plants metering control at “Infox Ltd.” branch “Infoxvodokanal”:

1. Metering of drained wastewaters that require full biological treatment is carried out by means of flowmeters located at the entrance to “Pivnichna” and “Pivdenna” biological treatment plants.
2. Data is taken every hour and fixed in logs of established form PID-11;
3. Data about volume of drained wastewater from wastewater plants shall be transferred every day at 00:00 o’clock to control department of each production unit;
4. Persons responsible for statistical reporting under the form 2-TP (vodhosp) shall draw up the fact sheets on the basis of dispatching record of drained wastewater before 10^{th} day of every month that are transferred to corresponding services of management apparatus of “Infox Ltd.” branch “Infoxvodokanal”;
5. Report 2-TP (vodhosp) shall be submitted to the Odesa Department of Water Resources after its verification by production-technical department and sales department of management apparatus on a quarterly basis. Payment for treated wastewater, shall be made according to this report.

Measures for recording control of BOD_{20} factor in wastewater (at the entrance to “Pivnichna”, “Pivdenna” treatment plants) at “Infox Ltd.” branch “Infoxvodokanal”:

1. Recording of BOD_{20} factor in wastewater entering Pivnichna”, “Pivdenna” is carried out by the representatives of chemical-biological laboratory;

2. The results of laboratory tests are recorded in the logs of the corresponding form that was defined by the company and then they are transferred to the department of chief technologist;

3. Samples of contaminated wastewater are selected according to the schedule to be determined by the company;

4. Persons responsible for statistical reporting, make reports on the basis of laboratory data analysis that are transferred to the management apparatus of “Infox Ltd.” branch “Infoxvodokanal” every month (not earlier that the 20th day after the previous report);

5. "Report on the chemical-biological laboratory work” is submitted to the State Inspectorate for Environmental Protection in the Northwest region. According to the report, the analysis and control of contaminated wastewater treatment is carried out.

After the implementation of JI project the following measure for control of electrical energy to be generated by “Infox Ltd.” branch “Infoxvodokanal” after the installation of the small hydroelectric power plant would be carried out:

1. Current control of electric energy meters operation at the small hydroelectric power plant would be conducted during a settlement period (settlement month is determined by the conditions of the contract on electric energy supply);

2. On the day stipulated by the contract (as a rule it is the day following the settlement month) the chief of the site or his authorized representative shall take the readings of electric energy meters (electric energy meters are the devices, which have to pass state certification, have to be registered under contractual conditions and jointly sealed by the representatives of power supplying organization). The head of the site shall transfer obtained information to the chief power engineer department;

3. “Report on electric energy meters readings” shall be made according to the readings of electric energy meters of all sites; the engineer who deals with electric energy bills shall provide this Report to the subscriber department of energy supplying organization;

4. Following the “Report on electric energy meters readings” subscriber department of energy supplying organization shall make the “Act of supplied electric energy”, approved by the company’s round seal and hand over to the department of “Infox Ltd.” branch “Infoxvodokanal” for confirmation;

5. All information shall be kept in archive of “Infox Ltd.” branch “Infoxvodokanal” in electronic and paper forms.

D. Calibration of meters

Meters shall be calibrated according to the national standards. (The CERTIFICATE # 164-EM as of June 22, 2005 on state metrological certification of the automated system of commercial metering of electric energy "ALTAR-INFOXVODOKANAL'; Metrology Division of "Infoxvodokanal" branch, Odesastandart-metrology). Details are provided in the Accompanying documents 3.

E. Recording and archiving of data

The person responsible for joint implementation project, appointed by the project's owner, shall monitor data in electronic and paper form. Electronic documents shall be printed and kept.
Project's owner shall keep the copy of the acts of supplied electric energy (original of the acts shall be kept by subscriber department).
All data and documents in paper form shall be archived and one backup copy shall be handed over to project's coordinator.

All data shall be kept during 2 years after delivery of emission reduction units generated by the project.

F. Trainings

Employees of VEMA S.A. will consult the persons responsible for monitoring elaboration at branch "Infoxvodokanal" before the beginning of the project activity and during the project period.

Data and parameters of monitoring:

Table 29. Data and parameters of monitoring

Data/Parameter	V_w
Data unit	m^3
Description	Volume of water supplied to customers by water supply system
Data source	Volume of water that is pumped by water supply pumping plants
Method of monitoring	Flowmeters installed at water supply pumping plants
Frequency of examination	Daily
Approving documents	Logbook PID-11 form

Data/Parameter	V_m
Data unit	m^3
Description	Total volume of wastewater carried by drainage system
Data source	Volume of wastewater that is pumped by wastewater pumping plants
Method of monitoring	Flowmeters installed at wastewater pumping plants
Frequency of examination	Daily
Approving documents	Logbook PID-11 form

Data/Parameter	V_t
Data unit	m^3
Description	Total volume of wastewater pumped over to system of aerotanks
Data source	Volume of wastewater that is pumped by wastewater pumping plants
Method of monitoring	Flowmeters installed at wastewater pumping plants
Frequency of examination	Daily
Approving documents	Logbook PID-11 form

Data/Parameter	EC_w
Data unit	kW*h
Description	Quantity of electric power, necessary for water transportation by water supply pumping plants
Data source	Quantity of electric power used by water supply pumping plants
Method of monitoring	Electric meters installed at water supply pumping plants
Frequency of examination	Monthly
Approving documents	Act of supplied electric energy

Data/Parameter	EC_m
Data unit	kW*h
Description	Quantity of electric power, necessary for wastewater transportation by drainage pumping plants
Data source	Quantity of electric power used by drainage pumping plants
Method of monitoring	Electric meters installed at wastewater pumping plants
Frequency of examination	Monthly
Approving documents	Act of supplied electric energy

Data/Parameter	EC_t
Data unit	kW*h
Description	Quantity of electric power, necessary for wastewater treatment by system of aerotanks
Data source	Quantity of electric power used by system of aerotanks
Method of monitoring	Electric meters installed at treatment plants (aerotanks)
Frequency of examination	Monthly
Approving documents	Act of supplied electric energy

Data/Parameter	EC_g
Data unit	kW*h
Description	Quantity of electric power generated by the small hydroelectric power plant
Data source	Quantity of electric power used by the small hydroelectric power plant
Method of monitoring	Electric meters installed at small hydroelectric power plant
Frequency of examination	Monthly
Approving documents	Act of supplied electric energy

Data/Parameter	BOD_t
Data unit	mg/l
Description	Biological oxygen demand, BOD_{20} concentration
Data source	“Pivnichna” and “Pivdenna” wastewater treatment plants
Method of monitoring	Laboratory analysis of “Pivnichna” and “Pivdenna” wastewater treatment plants
Frequency of examination	Monthly
Approving documents	Report made by chemical and biological laboratories