Initial Environmental Examination

June 2015

Viet Nam: Water Sector Investment Program (Tranche 4)

Prepared by Hanoi Water Limited Company for the Asian Development Bank.

Asian Development Bank

MFF0054-VIE: PFR-4

DEVELOPMENT OF WATER SUPPLY SYSTEM ALONG LANG - HOA LAC EXPRESSWAY (Within Hanoi City)

FINAL REPORT

APPENDIX 11

INITIAL ENVIRONMENTAL EXAMINATION REPORT

June 2015

ABBREVIATIONS AND ACRONYMS

BOD	Biological oxygen demand
BPS	Booster pumping station
CSC	Construction Supervision Consultant
COD	Chemical oxygen demand
DO	Dissolved Oxygen
DOC	Department of Construction
DOF	Department of Finance
DONRE	Department of Natural Resources and Environment
DPI	Department of Planning and Investment
DPs	Displaced Persons
DN	Diameter of the Water Pipe
HAWACO	Hanoi Water Company
IEMC/EMC	Independent Environmental Monitoring Consultant
EMP	Environmental Management Plan
EPA	Environmental Protection Association
FS	Feasibility Study
FTA	Federal Transit Administration of United States of America
GoV	Government of Vietnam
GW	Ground water
HC	Hydrocarbons
HH / HHs	Household / households
LIP	Livelihood Improvement Plan
LSC	Labor Safety Committee
MEDP	Minority Ethnic Development Plan
NWL	Normal Water Level
PAHs	Project Affected Households
PC	People's Committee
PCCC	Fire Prevention and Distinguishing
PDO	Project Detail Outline
PM	Particulate matter
PMU	Project Management Unit
PPC	Provincial People's Committee
QCVN	Vietnam National Regulation
QL	National Road
RoW	Right of Way
RP	Resettlement Plan

SC	Steering Committee
TCVN	Vietnam National Standard
TL	Provincial Road
TN	Total nitrogen
TOR	Terms of Reference
TP	Total phosphorus
TSP	Total suspended particles
TSS/ SS	Total suspended solids
URENCO	Urban Environmental Company
VINACONEX	Vietnam Construction Import and Export Company
VIWASE	Vietnam Water, Sanitation and Environment JS Company
VIWASUPCO	Vinaconex water Supply Company
VND	Vietnam Dong
ADB	Asian Development Bank
WHO	World Health Organization
WSP	Water Supply Plant

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I. EXECUTIVE SUMMARY

Background and Scope

1. The water supply project along Lang Hoa Lac expressway axis (within Hanoi City) aims to provide clean water to the West part of the City. The Project, managed by the Hanoi Water Company (HAWACO), has two components. Component 1 consists in expanding the water supply area along the Lang Hoa Lac Road and the construction of a booster pumping station in Son Tay. Component 2 will serve to improve management capacity and efficiency operation of HAWACO.

2. The project, classified as Environment Category B, is judged to have low potential adverse environmental impacts, particularly in relation to pipeline construction activities and the booster pumping station construction and managment. The unavoidable construction impacts are temporary and can be mitigated.

3. The clean water source of this project is supplied by Vinaconex from the Da River water treatment plant which will supply the booster pumping station and various pipelines and distribution networks along Lang Hoa Lac Road in the western part of Hanoi in Hoai Duc, Quoc Oai, Thach That, Ha Dong districts.

Project description

4. The main components of the projects are:

- Construction of a booster pumping station with a capacity of 30,000 m^3/day;
- Construction of 83.2 km of main transmission pipelines;
- Construction of 443.0 km of distribution pipelines;
- Construction of 996.1 km of service pipelines;
- Installation of water meters for around 100,000 HH;
- Installation of fire hydrants (532 items);

5. The Project will benefit around 100,000 existing households and will contribute to the development of this area which is planned to be the new expansion area of Hanoi City.

Impacts and Mitigation Measures

6. In general, the environmental impacts related to this project are mainly positive. It will provide clean water to 100,000 existing households and will support the expansion of the western part of Hanoi city and particularly the three districts of Hoai Duc, Quoc Oai and Thach That.

7. The negative impacts of the project are small-scale, primarily short-term construction-related impacts which are summarized in the following table:

Activity	Impact
1.0 Construction Phase	
1.1 Land clearing, excavation, grading	Potential presence of UXO, dust, noise, vibration, construction & worker camp solid & liquid waste, spilled contaminants (lubricants, gasoline), traffic disruptions, worker & public
1.2 Transport of construction materials & equipment	
1.3 Operation of equipment	

Activity	Impact
1.4 Development of water supply infrastructure Pipeliens and & Booster Pimping Station	accidents, erosion & landslides
2.0 Operation Phase	
2.1 Booster Pumpng Station	dust, noise, vibration, solid & liquid waste, spilled contaminants (chlorine, alum), worker accidents, fire, explosions
2.2 Treated water distribution	

8. To reduce negative impacts an Environmental Management Plan (EMP) has been prepared for the pre-construction, construction, and operation phases of the water supply project.

Information Disclosure, Public Consultation, and Grievance Redress

9. VIWASE carried out consultation during the preparation of the draft IEE that consisted of meetings with each affected commune. In Song Dong commune, where the households affected by the Booster Puming Station (BPS) are located, consultation took place on 24 April 2013. Public consultation will continue throughout the project cycle.

10. Key information on this IEE has been disclosed to the AHs through public meetings. The draft IEE and updated IEE will be disclosed as per disclosure requirements laid out in ADB's SPS.

11. The grievance mechanism has been designed to ensure that AHs' concerns and grievances are addressed and resolved in a timely and satisfactory manner. Commune and District/Town People's Committees are primarily responsible for resolving any grievances received from the AHs. HAWACO will shoulder all administrative and legal fees that might be incurred in the resolution of such grievances and complaints.

Environmental Management Set-up

12. The project will be implemented under the Hanoi People's Committee (the Executing Agency) and HAWACO is the Implementation Agency. A Project Management Unit (PMU) has been esablished to supervise the implementation, on behalf of HAWACO.

13. The PMU will be responsible for fulfilling the environmental requirements of the project, in particular for incorporating the mitigation measures and safeguards identified in this report in the detailed engineering design of the pipeline, BPS and distribution network, as well as in the bid documents and construction contract documents.

14. An Environmental Monitoring Consultant (EMC) will be hired to provide environmental monitoring support during project construction and implement pubic consultation planned.

15. Safeguards compliance monitoring during the construction phase-particularly compliance with safeguard measures specified in construction contracts, as recommended in this report--will be incorporated in the duties of the construction supervision company to be engaged by HAWACO (and supervised by the PMU).

Project Implementation Schedule

16. The main project tasks are presented in the table below:

Activities	Schedule
ADB concurrence on IEE	April 2015
Project appraisal	Quarter II/2015
Prepared detailed design	2015-2017
Conduct baseline environmental survey	Quarter I/2017
Update EMP	Quarter I/2017
Coordinate with the Environment Protection Center on regulatory compliance issues	Quarter II/2017
Start of Construction	Quarter III/2017
Monitoring	Start Quarter III/2017

Conclusion and Recommendation

17. The proposed project will produce significant benefits for the populations of Hoai Duc, Quoc Oai, Thach That and Ha Dong district specifically by enabling HHs that are currently not served or only partially served by local unsafe water resources to shift from reliance on wells as a source of water (which has to be boiled or filtered) to more secure and safe piped water source.

18. The potential adverse environmental impacts of the project are the consequence mainly of construction activities, in particular the potential impairment of water and air quality in areas near the pipeline network, and nuisance and safety hazards posed to nearby HHs and small businesses. However, these impacts are temporary and can be mitigated.

19. HHs that will be affected by construction activities, either because of damage to property, will be compensated in accordance with ADB guidelines. These measures are presented in a separate report focused on the project's resettlement and compensation aspects.

20. For purposes of compliance with ADB environmental assessment guidelines, no additional study or full environmental impact assessment is needed to further assess the potential environmental impacts of the project.

I. INTRODUCTION

A. Project Background

1. Hanoi city, after extension of its administrative boundary in 2008, has now an area of 334,470.02 hectares (3.6 times the area of its previous territory) with a population of 6,448,837 people. Proportion of Hanoi's urban population with full access to water service after expansion is 94.8%. In the suburban districts located West of Hanoi: Hoai Duc, Thach That, Quoc Oai, only 6% of the population has access to treated water. In 2009, Hanoi approved the Program of Treated Water and Rural Sanitation 2011-2020 with a 2015 target of 60% of the rural population have access to safe drinking water as per standards provided by the Ministry of Health. The target is 80% in 2020.

2. To achieve the above targets, Hanoi has prepared a plan for socio-economic development for 2011-2015 which emphasizes "investment for synchronous infrastructure development in both urban and rural areas, to invest in transportation systems, water supply, and environment protection ". Hanoi city also decided to use ODA funds in priority for investment in the water supply, drainage and rural sanitation.

3. Considering the results achieved in the field of urban water supply under the plan of economic and social development (SEDP) for the period 2006-2010, the ADB approved a multitranche financing facility (MFF) on 22 February 2011 for $1,000 million from the Ordinary Capital Resources (OCR) for the water sector in Vietnam.

4. The development of water supply system along Lang - Hoa Lac highway transferring treated water from Da River WTP constitutes the fourth Periodic Funding Request (PFR-4) of the MFF for support of the water sector in Viet Nam. The Project has been integrated within the 5-year Plan for Socio-economic development of Hanoi.

5. This project, classified as Environment Category B, is judged to have low potential adverse environmental impacts, particularly in relation to pipeline construction activities and the booster pumping station construction and managment. The unavoidable construction impacts are temporary and can be mitigated.

6. This report was prepared in 2013 essentially by VIWASE. It was prepared in compliance ADB Safeguard Policy Statement (ADB SPS 2009). It follows the standard outline for environmental assessments: legal and administrative framework; description of the environment; description of the project and its significance; assessment of environmental impacts and mitigation measures, including alternatives considered; public consultation and information disclosure; and environment management plan.

7. The scope of this assessment covers: (a) the construction of a booster pumping station and (b) major pipeline and treated water distribution.

B. Organization to implement the IEE

8. The organization to implement the IEE is as follow:

Owner

Name : HANOI WATER COMPANY LIMITED (in short HAWACO Co.,Ltd)

Contact address : 44 Yen Phu Rd., Ba Dinh District, Ha Noi

Telephone : 84 04 3829 3179 Fax : 84 04 3829 2069

Representative person : M.Sc. Nguyen Nhu Hai Position: General Director

Consulting unit

Name of the consulting unit: Vietnam Water, Sanitation and Environment Joint Stock Company - VIWASE

Contact address: No. 5 Duong Thanh St., Hoan Kiem, Ha Noi

Telephone: 84 04 3825 1429 Fax: 84 04 3828 4760

Representative person : Eng. Nguyen Van Thanh Position : General Director

Table 1 List of the specialists who prepare the IEE Report

Order	Name	Company	Position
1	M.Sc. Trịnh Kim Giang	HAWACO	Deputy General Director /Specialist in water supply and drainage
2	M.Sc. Lê Văn Tuấn	VIWASE	Deputy General Director / Specialist in water supply and drainage /environment
3	M.Sc. Nguyễn Lê Phú	VIWASE	Director of Center for Envir. and Social Sustainable Development
4	Dr. Nguyễn Việt Hùng	VIWASE	Environmental Specialist
5	Eng. Đinh Viết Đường	VIWASE	Environmental Specialist
6	Eng. Đoàn Minh	VIWASE	Specialist in water supply and drainage
7	M.Sc. Nguyễn Kim Minh	VIWASE	Specialist in water supply and drainage
8	B.Sc. Quang Thu Nguyệt	VIWASE	Environmental Specialist
9	M.Sc. Hồ thị Hương	VIWASE	Environmental Specialist
10	M.Sc. Trần Thị Hiền	VIWASE	Environmental Specialist
11	Eng. Bùi Thái Bạch Dương	VIWASE	Environmental Engineer
12	Eng. Nguyễn Xuân Thiên	VIWASE	Environmental Engineer
13	Eng. Nguyễn Đình Thành	VIWASE	Environmental Engineer
14	Eng. Phạm Thị Trâm	VIWASE	Environmental Engineer
15	B.Sc. Dương Thị Diên	VIWASE	Environmental Engineer
16	B.Sc. Bùi Văn Khiêm	VIWASE	IT Specialist
17	B.Sc. Đào Thanh Thái	VIWASE	Social Specialist

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

9. Vietnam's Law of Water Resources was passed in June 2012. It establishes water as a resource to be managed as an economic good. Water resources boundaries are to be delineated according to hydrological rather than administrative boundaries. The law also gave strong institutional focus on creating a national apex body for water resources management, the setting up of river basin organizations, decentralization of management for water resources assets including infrastructure, and greater accountability for water services delivery.

10. The water law also provided for establishment of more effective regulatory institutions, including the use of abstraction licenses, discharge permits and more strengthened safety procedures for infrastructure development and operation. The Law was not only intended to facilitate shift to more sustainable and economically efficient development of the country's water resources; it was also intended to support achievement of the country's broader imperatives of poverty alleviation, socio-economic development and environmental protection.

11. The Ministry of Agriculture and Rural Development (MARD) was originally responsible for implementing the water law; this responsibility was later transferred to the Ministry of Natural Resources and Environment (MoNRE). Subsequently, MoNRE was mandated to direct river basin management activities throughout the country.

12. Under the Law on Water Resources, the GoV issued Decree No. 201/2013/ND-CP: on stricter regulations for effective water resource management. Under this Decree, projects requesting water abstraction from underground or surface water or for discharging wastewater into water bodies have in particular to get permits and to collect opinions of representatives of local communities. The aforesaid projects include reservoirs and dams with a total capacity of at least 500 cubic meters and works using surface water with a total flow of 10 cubic meters per second, reservoirs and dams interrupting rivers' and streams' current for at least one kilometer, and works discharging wastewater into local water sources with a flow of 10,000 cubic meters per day.

13. The Law of Environmental Protection (LEP) was originally passed in 2003 and took effect in January 2004. Decree 175/CP issued in October 2004 provided implementing guidelines for (a) assignment of environmental management responsibilities among ministries, provinces and people's organizations; (b) an environmental impact assessment system; and (c) a regulatory permitting system based on standards. Chapter III of Decree 175/CP contains requirements for the submission of environmental impact assessments by investors and enterprises; the appendices to the Decree also contained detailed provisions prescribing the format and content of EIA reports. In 1998, Circular 490 was issued providing additional guidelines for the preparation and review of EIA reports.

14. In November 2005, the LEP was revised. Decree 80/2006, issued in August 2006, provided detailed implementation guidelines for the amended law, replacing Decree 175/CP. Decree 80/2006 was added in December 2008 by Decree No. 21/2008 of the Government. By June 2011, all provision relating to the EIA of the investment project were replaced by Decree 29/2011 dated 5/6/2011 of the Government. Then, the MoNRE issued Circular No. 26/2011 guiding the implementation of Decree 26/2011. The project-based EIA system was strengthened, and a new environmental management tool was introduced in the form of

strategic environmental assessments (SEA) for national, provincial and inter-provincial development plans, policies and programs. Responsibility for conducting SEAs is assigned to the state agency responsible for formulating the strategy or plan. Environmental Impact Assessment is applied to the investment projects as specified in Decree 26/2011, whereby the agencies who appraise and approve the EIA report are MoNRE, Ministries made decision on investment and People's Committee of provinces and cities. The commitment to environmental protection made for small-scale projects is to be implemented in two forms: environmental protection commitment and NVMT commitment, simply with the approval of authorized DPC or commune/ward.

15. The National Assembly of Viet Nam approved a new Law on Environment Protection (LEP) on 23 June 2014 and is effective since January 1st,2015. Implementing guidelines and associated regulations are under preparation.

16. . Environmental management in Viet Nam is administered on the national level by the MoNRE. The environmental arm of MoNRE, the National Environmental Agency (NEA), is the body specifically tasked with environmental protection. Aside from MoNRE, environment divisions in the various line Ministries are tasked with environmental management functions related to the specific sectors.

17. At the provincial level, the relevant management authorities are the Departments of Natural Resources and Environment (DoNRE) which carry out their environmental protection activities through their respective environment divisions. In the case of Hanoi DoNRE, an Environment Protection Centre is responsible for monitoring environment quality and providing technical solutions. The DoNREs come under the purview of the central MoNRE only in relation to administrative matters and technical guidance. For all other purposes, the DoNREs operate under the direct control of their respective provincial governments, through the People's Committees.

18. The Project required GoV approval through the Hanoi DoNRE. Hanoi DoNRE already approved the Environmental Impact Assessment for this project on 2 October 2013. Letter of approval is presented in Annex 6. Contractors have to comply with all statutory requirements set out by DoNRE for use of construction equipment, hazardous waste & chemicals management, and operation of construction for the booster pumping station in Son Tay.

19. At district level, the relevant management agency is Division of Environment and Natural resources under District's PC. This division has qualified team responsible for environmental protection and consulting for District's PC leaders to make responding environmental decisions.

20. This project being funded in part by the ADB the Safeguard Policy Statement (SPS) applies and requires all the borrowers to identify project impacts and assess their significance; examine alternatives; and prepare, implement, and monitor environmental management plans. The SPS requires borrowers to consult people likely to be affected by the project and disclose relevant information in a timely manner and in a form and in languages understandable to those being consulted. Regarding IEE, SPS required the description of the environmental condition of a project, including potential impacts, the formulation of mitigation measures, and the preparation of institutional requirements and environmental monitoring for the project.

21. The ADB determined that the Project is Category B and subject to IEE. The ADB defines a Category B project as follows (ADB SPS 2009):

> ***Category B.*** *A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.*

22. The legal references (Laws, Decrees, National regulation and standards) for this project are listed in the annex 1b. The laws overseeing this project are the Law on Water Resources, on environmental protection No.52/2005/QH11*[1], on Construction, on Vietnam technical regulations, on Cultural heritage and several others on basic construction investments.

[1] *The project was developed and adopted before the new version of the law (January 1st, 2015), therefore, the project has been evaluated and will be monitored according to the previous version of the Law on environmental protection.

III. PROJECT DESCRIPTION

23. Hanoi expansion area is planned in the west part of the City. The opening of the Lang Hoa Lac expressway plays a major part of that expansion. Therefore prior to increase the development of this area, the expansion of the water distribution system is necessary to provide clean water to the actual local communities in the sector but also to provide a source to the future residents and the commercial and industrial development that will follow.

24. Prior to this development, several facilities were installed related to the water supply project along Lang Hoa Lac Road as noted in the table below.

Table 2 List of some relevant facilities

No	Relevant facilities	Time completed	Construction unit	Operation unit
1.	Da River water WTP	2008	VINACONEX	VIWACO
2.	Water supply system of Quoc Oai district	2011	Ngoc Hai trade and production JS Company	Ngoc Hai trade and production JS Company
3.	Water supply station at Duong Lieu commune	1991 – It is within restore mode now	It was handed to HAWACO for restoration and renovation	
4.	Water supply station at Huu Bang commune	2005	2008 year, Phung Xa commune PC handed it to the Binh Duong limited Company to continue investment, construction and management	
5.	Water supply station at Phung Xa commune	2011	THT environment and water Company	THT environment and water Company

25. The project of investment and development of water supply system using the clean water of Da River, along the Lang - Hoa Lac expressway will have two components. Figure 1 identifies the project area

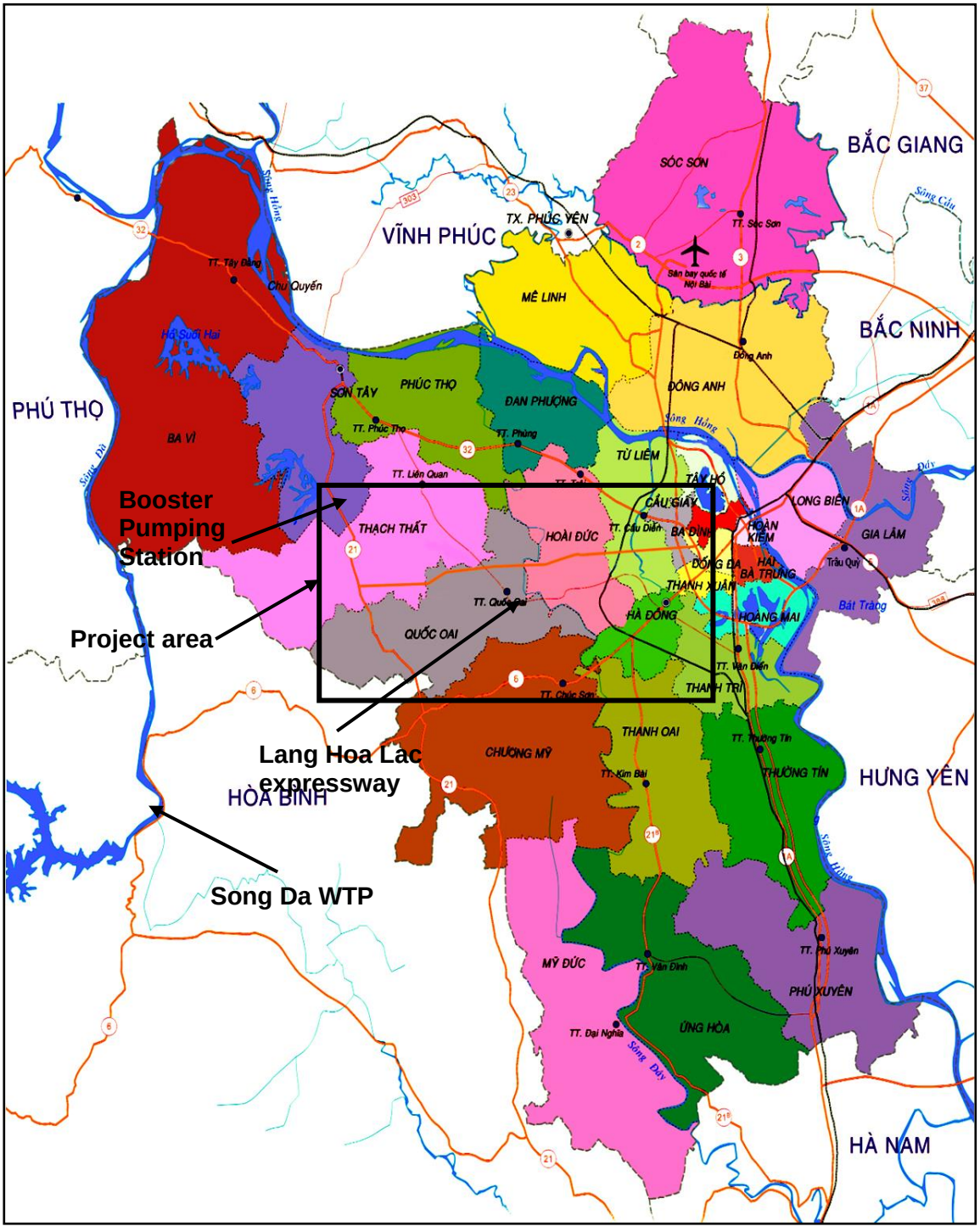
26. The first component concerns the infrastructure part of the project which is the construction a booster pumping station (BPS) to redirect the water provided by the Da River WTP and a new water supply grid to supply new and existing agglomeration located along the Lang Hoa Lac Road axis in the districts of Hoai Duc, Quoc Oai and Thach That. It includes the pressure BPS, the transmission pipeline sections, distribution pipeline sections, service pipeline sections and the various connecting points;

27. The second component consists in upgrading the management capacities of HAWACO to monitor their installations with the implementation of available technologies and training. This part of the project includes:

- Georeferencing of the existing water supply system in a GIS;
- Database building of the data control and collection system (SCADA);
- Programmation of the hydraulic Simulation city water supply system with specialized software;

- A demonstration of the hydraulic power of the water supply network of Hoan Kiem Clean Water Trading enterprise according to specialized software;
- Linkage through a software of the GIS database and the hydraulic power demonstrating software and SCADA;
- Education and training to the work force;
- Installation of the equipment for operational management;
- Creation of a specialized IT division.

Figure 1 Project Location



28. The first part of the first component is composed of the booster pumping station (BPS) and administrative building at Son Dong - Son Tay town. The selected site is located in the area of the milestone No. 7 km on the national Highway No. 21A, 7 km from Son Tay town and, 23 km from Xuan Mai which belong to Son Dong commune in Son Tay town, Hanoi city. The proposed area to build the pumping station is an agricultural lot behind a row of residential houses in Son Dong commune, near the national Highway No. 21A. It should be noted that graves are present behind the residential lot and some of them will have to be respectfully move from the area. Also, the actual access to the proposed area for the pumping station is a shared entrance only accessible by foot. Modifications to this path will be necessary to acess the main building reservoirs and pumping stations and administration.

Figure 2 Actual Site entrance

Figure 3 Construction site for the BPS

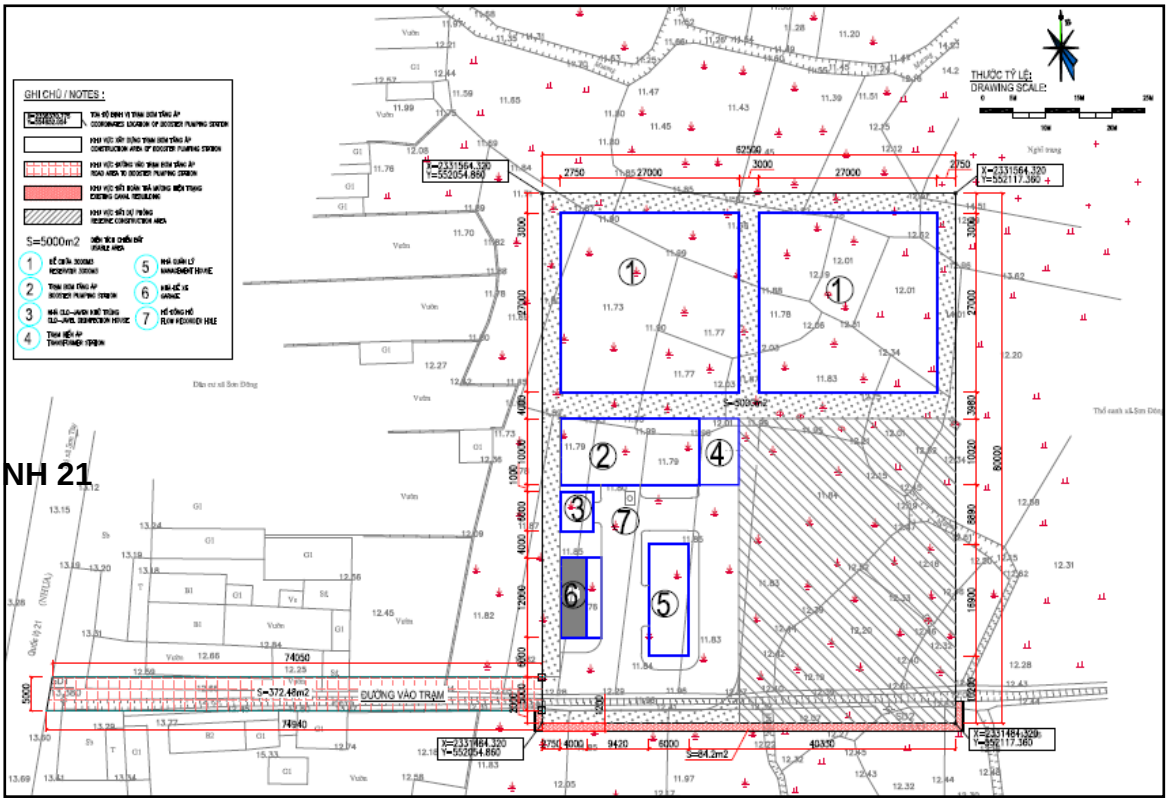
29. The specifications of the BPS are listed in the table below:

Table 3 Size of BPS

No.	Items	Unit	Scale	Description
1.	Proposed volume of water reservoirs/water tanks at Son Tay pressure BPS	m^3	6,000	- Capicity of tank has decided to 2020 (3756 m^3) and 2030 (5008 m^3) - Construction two tanks with a capacity of 3000 m^3
2.	Capacity of Son Tay BPS	m^3/day	30,000	Dimensions stations are : Treating tank = 10,0m x 27m. Among: – The pump size is 10m x 21m Specifications of each domestic water pump is : Qb = 520-580 (m^3 / h) , H = 60-55 m ; N = 160 kW – In the pumping station has 4 pumps (3 pumps working , 1 standby pump) and 2 pedestal pump reserve development in the next stage .
3.	Pumps for pressure boost with a capacity of 520-580 m^3/h; Height = 60-55 m; capacity N =160kW	pcs	4	
4.	Transfomer station	machine	2	- The above station size is 10m x 6m. Transfomer station put 2 machine 1000kVA – 10(22)/0.4kV. Stage to the 2020: 01 transformer is working machine and 1 standby machine
5.	Sodium hypochlorine sterilization system	system	1	The average concentration of NaClO+ is 0,4 mg/l Treating tank = 5m x 6m Installation 02 quantitative pumps of NaCl+ has effenciety 160 l/h; H=50m N= 0,18 kW Installation of water pipes 40 mm to supply water for the NaClO system.
6.	Other items: - Management building: BxL = 7m x 16.9m - Garage for the storage and maintenance of company vehicules - Asphalt paved site entrance 5 m wide and 75 m long - Fence - leveling : see section 3.2.4 Note that the BPS structure will be made out of concrete			

30. The proposed area to build the BPS is a 5000 m^2 lot (62.5 m by 80 m) and it's location an be observe in the following figure.

Figure 4 Proposed area to build Son Tay BPS



31. The second part of the first component consist in installing a new clean water grid from the main pipelines consisting of 12 sections which will be the starting point for the water distribution networks. The areas covered by the project are in Hoai Duc district, Thach That district, Quoc Oai district, Son Tay Town, Ha Dong district, Tu Liem district and Thanh Tri district. Some water transmission pipeline sections will be built along the existing roads; other will be built along the planned roads.

32. The following table indicate the proposed length of sections of clean water transmission pipelines, distribution pipelines, service pipelines and connecting points between the sections.

Table 4 Proposed length of sections of the clean water pipelines

No.	Name of pipeline	Length of the pipe, (m)					Road's characteristic			Location of pipe			Road width (m)	Notes
		DN 1200	DN 800	DN 600	DN 400	Total	Existing	Planning		Side	Median	Pave ment		
								Widening	New construction					
1a	DN1200mm pipeline along Road 70, Thang Long Boulevard - Nhon	5,140				5,140		√				√	50	The width of paverment is 8 m
1b	DN1200mm pipeline along Road 70, Thang Long Boulevard-Ha Dong	6,770				6,770		√				√	30 - 40	The width of paverment is 6 - 7.25 m
1c	DN800mm pipeline along Road 70, Ha Đong-Van Dien		7,512.2			7,512.2		√		√			50	
2	DN400mm pipeline along Ring Road 3.5 (Le Trong Tan extention), Thang Long Boulevard - Road 32				5,725	5,725			√			√	60	The width of paverment is 8m
3	DN600mm pipeline along Road 422 linking Road 422B, from Ring Road 4 to Road 70			6,135		6,135	√			√			12	
4	DN600mm pipeline along Road 32, Le Trong Tan - Phung			4,740		4,740	√					√	35	The width of paverment is 6m
5	DN400mm pipeline along Thang Long Boulevard to Tram				8,630	8,630	√			√			9 - 12	
6	DN800mm pipeline along Ring Road 4-Road 32 – Road 6		8,713			8,713			√	√			34.5	Pipe will be laid in the frontage road of Ring Road 4
7	DN600mm pipeline along Road 419, Quoc Oai - Phuc Tho			7,080		7,080	√			√			12	

No.	Name of pipeline	Length of the pipe, (m)					Road's characteristic			Location of pipe			Road width (m)	Notes
		DN 1200	DN 800	DN 600	DN 400	Total	Existing	Planning		Side	Median	Pave ment		
								Widening	New construction					
8	DN600-400mm along Road 420, from Road 419 to Huong Ngai, Canh Nau, Di Nau			800	4,015	4,815	√			√			7 - 8	
9	DN800-600mm along Road 21 T-junction Hoa Lac to Son Tay		4,638	10,802		15,440		√			√		35	
10	DN400mm pipeline along Thang Long Boulevard from letf dyke of Tich River to Ngoc Liep commune				815	815	√					√	~ 25	Pipe will be laid in the frontage road of Thang Long Boulevard; The width of pavement is 10m and the surface of pavement is solid
	Total	**11,910**	**20,863**	**29,557**	**19,185**	**81,515**								

NB: Names of sections serves as a reference in the map of figure of the present document.

33. Connected to the mainframe grid several smaller pipes will be laid with service instruments such as:

- Installation of DN90-DN300 pipes to provide water for thirty-three (33) communes and one (1) town located in three (03) district, including Hoai Duc, Thach That abd Quoc Oai, for a total length of 443,65 km;
- Installation of D50-63 service pipes for a total length of 969,12 km;
- Installation 88,102 water meters for each newly connected HHs;
- Installation of 532 fire hydrants;
- Installation of nine (9) main water meters on DN500-100 major water supply pipes and inter-regional connections;
- Installation of fourty-five (45) secondary water meters on DN200-50 water supply pipe for the commune.

34. The water distribution and service pipelines and connecting points/joints will be built in the areas of three districts of Hoai Duc, Thach and Quoc Oai, as following:

a. Section 1: North section of road Lang - Hoa Lac: from National Highway No. 70 to Day River, limited by National Highway No. 32

   Hoai Duc district: Di Trach commune, Kim Chung Commune, Thuong Duc, Duc Giang, Cat Que Commune, Duong willow, Minh Khai commune, Song Phuong Commune, Yen commune, Dak commune Department, Tien Yen, Son Also, Van Canh commune, Yen Lai (14 communes) and Tram Troi town.

b. Section 2: South section of road Lang - Hoa Lac, from crossing point between National Highway No. 70 and National Highway No. 1A, along National Highway No. 70 to Provincial Highway No. 72 to south Hoai Duc district, to Day river.

   Hoai Duc district: Van Con commune and An Thuong commune (2 communes).

c. Section 3: North section of road Lang - Hoa Lac, from Day River to Tich River, limited by Road 420.

   Thach That district: Huu Bang Commune, Phung Xa commune, Thach Xa Commune, Binh Phu commune, Kim Quan commune, Chang Son Commune, Huong ngai commune, Canh Nau commune, Di Nau commune and Can Kiem commune (10 communes).
   Quoc Oai District: Yen Son commune and Sai Son commune (2 communes).

d. Section 4: South section of road Lang - Hoa Lac, from Day River to Tich River, limited by the boundary line between Can Huu commune and Dong Quang commune.

   Quoc Oai District: Ngoc Liep commune, Ngoc My commune, Dong Quang commune, Thach Than commune, Nghia Huong commune, Liep Tuyet commune, Phuong Cach commune and Can Huu Commune, (8 communes).

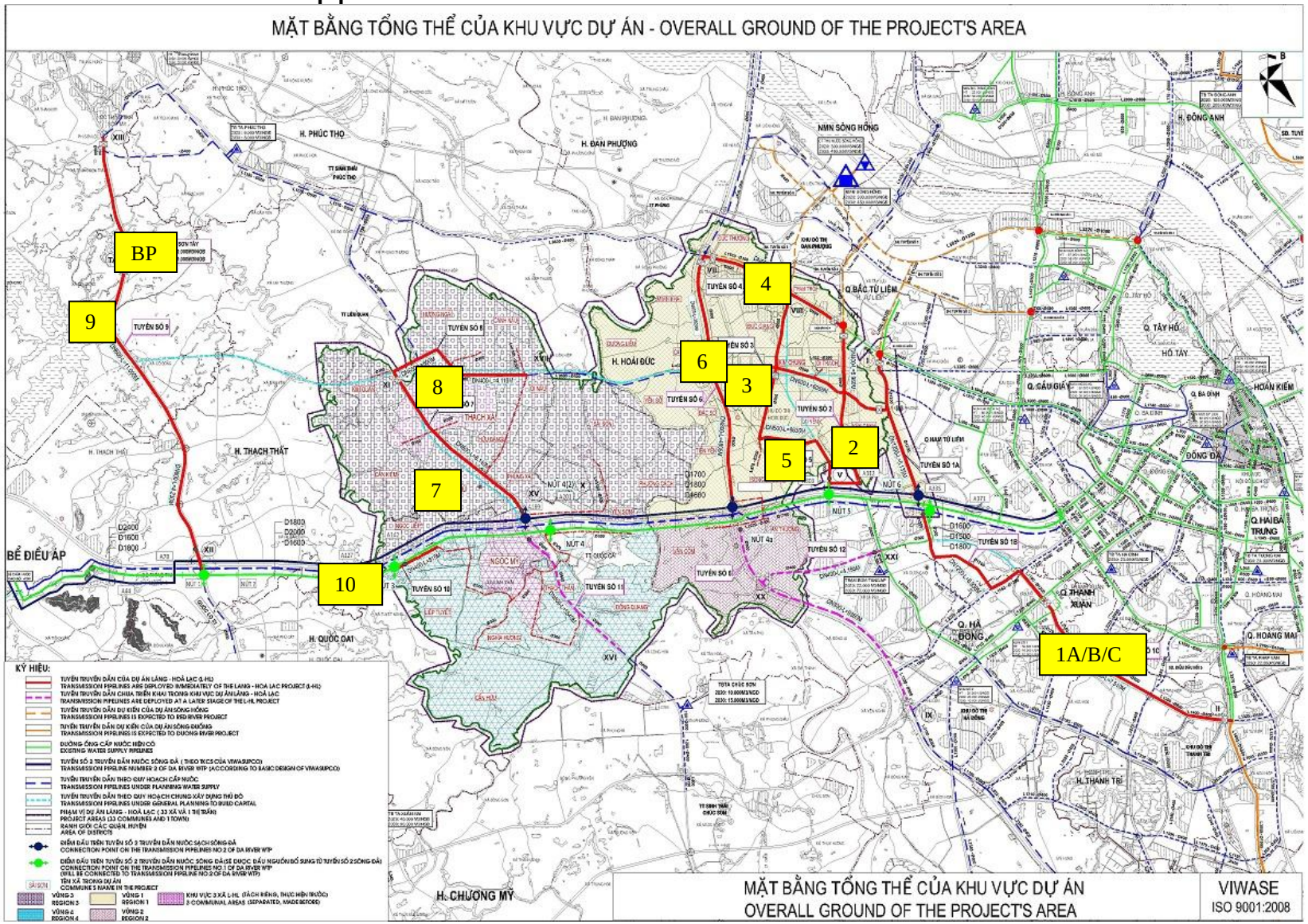
   Features of Section 1 and Section 2: These areas are the extension areas of the city's inner toward South Red River from Nhue River to Boundary Road No. 4. These areas have the new urban areas and the old residential areas. These areas have been planned according to Subdivision S2 and Subdivision S3, planning in traffic network in

rather detail, convenient to build roads in synchronisation with other technical infrastructures.

Features of Section 3 and Section 4: These areas are the intermediate rural areas of the ecological urban areas, population density is low, traffic network is mainly inter-commune or inter-district roads, the areas are now planning overall in construction.

Figure 5 below shows the geographical location of four proposed areas to build the distribution and service pipelines of the projects of investment and developmnent of water supply system using Da River Clean Water Resource, Section Lang - Hoa Lac (Ha Noi city).

Figure 5 Location of transmission pipelines



A. Required work for project completion

35. Pursuant to the approved detail design of the project and hauling volume of building the project in the following Table, Contractor must be responsible for making/submitting measures to build, calculating in detail the volume of building the item works of the project in compliance with the regulations of Decree No. 12/2009/NĐ-CP dated February 10, 2009 by Government on the project management in the construction investment; Decree No. 83/2009/NĐ-CP dated October 15, 2009 by Government on amendment, adjusting and supplement of some regulations of Decree No. 12/2009/NĐ-CP; Decree No. 209/2004/NĐ-CP dated December 16, 2004 by Government on management of works quality and Decree No. 49/2008/NĐ-CP dated April 18, 2008 by Government on adjusting, amendment and supplement of some regulations of Decree No. 209/2004/NĐ-CP.

Table 5 Proposed volume of gravelly soil and sand excavated, banked and transported

Building items	Building volume (m^3)		
	Gravelly soil excavated	Gravelly soil and sand banked	Gravelly soil transported
Section of clean water transmission pipelines	229,276.77	194,520.60	229,276.77
Section of distribution and service pipelines in Quoc Oai district	107,625.35	89,923.97	107,625.35
Section of distribution and service pipelines in Thach That district	87,418.85	73,341.15	87,418.85
Section of distribution and service pipelines in Hoai Duc district	198,004.62	165,001.83	198,004.62
Pressure boost pumping station	1’696.03	9’254.04	1’696.03
In total	624,021.62	532,041.59	624,021.62

N.B.: All soil from excavation at the BPS site will be transported away from the lot. Volume transported are net.

36. According to the regulations of Decree No. 209/2004/NĐ-CP, Contractor must be responsible for establishing measures to build in order to submit for approval before the the implementation of construction. Measures to construction made by Contractor must comply with the following regulations:

- Contractor must make measures to build safely for workers and works at site. Measures and regulation in labor safety must be showed openly, letting all people know and comply. Dangerous places at site must be arranged guiding persons or warning signs.
- Contractor, Investor and relevant sides must check and supervise regularly the affair of labor safety at site. When founding the violation, it will be necessary to suspend the construction. Those who let the accidents of labor safety occur, wrongdoer must be responsible for his or her wrongdoing or must be prosecuted.
- Contractor must be responsible for training, educating, leading, guiding, instructing and informing the regulation on labor safety. For some jobs that require seriously labor safety, workers must be required certificates in labor safety. It is strictly forbidden to employ the

workers that do not have the certificate in labor safety or do not be trained, instructed in labor safety.

- Contractor must be responsible for providing workers with all labor safety equipments and tools according to the regulation when employing workers at site.
- Contractor need to implement measures to ensure the environmental hygien for the workers at site and protect the enviroment including measures to prevent dust, noise, measures to treat wastes and measures to collect/gather and transport wastes to the permitted places.
- In the process of transporting the building materials and wastes, it will be necessary to take measures to cover or shield in order to ensure labor safety and the environmental hygien.
- Contractor must be responsibe for checking and monitoring the implementation of the environmental protection during construction.

37. For clean water transmission and distribution pipelines: After clearing the ground, digging trenches, gathering materials, installing pipelines, it will be necessary to re-level or re-fill the ground, pavement or roadbed similar to the original state.

38. For the pressure boost pumping station and reservoir, measures to build and the process of building must be complied with the instructions of the detail design of construction.

a. Equipment and materials of the project

39. Project “Investment and Development of Water supply system along Lang Hoa Lac Road (Within Hanoi City limits) transferring treated water from Da River WTP.” will use equipments like excavators, flatbeds, 15 tons haulers, cranes, compactors, rammers, plastic welders, pumps and power generators.

40. The ressources and materials use in the project will mainly be cast-iron pipes, gas valves, discharge sediment valves, water flow meters, plastic pipes, pumps, chloride metering pumps, automatic chlorine neutralizer, solution NaOH 20% for neutralizing the leaked chlorine and liquid chlorine as well as sand, gravel, asphalt and all materials to build the BPS site buildings.

b. Proposed schedule of implementation of the project

41. Table below shows the proposed schedule of the implementation of the project “Investment and Development of Water supply system along Lang Hoa Lac Road (Within Hanoi City limits) transferring treated water from Da River WTP”.

Table 6 Proposed schedule of implementation of the project

Project Stage	Environmental Regulatory Requirement	Approving Entity	Date
Detailed Engineering and Design	Updating of EMP by EA	Hanoi DONRE	Third quarter 2015
Bidding	Environmental Protection Commitment and EMP in bid documents	Hanoi DONRE	Fourth quarter 2015
Notice to Proceed	Updated EMP prepared by contractor with budget (if necessary)	Hanoi DONRE	First quarter 2016
Construction	Permit to Cut/Ball Out trees	Hanoi-DONRE	First quarter 2016

c. Objectives of the project

42. The optimal finality of the project will have effects on the short and long term development of this area of Hanoi city. On the short term, it is expected that the project will supply clean water to citizens in 33 commune and one town spread over three district (Hoai Duc, Quoc Oai and Thach That) by 2020. It represent a total of 95,538 households that will be connected in 2019 and provided with water meeting the Vietnamese quality standards. The project will also implement the Program target of clean water and environmental sanitation of Hanoi city (to 2020 year). The proportion of rural population using clean water will reach 80% and improve their environment quality.

43. It will also contribute to promote efficient investment of Da River WTP, which has a capacity of 400,000-450,000 m^3/day in 2015 to reach the 600,000 m^3/day mark in 2018

44. Finally, it will increase management capacity and operational efficiency of HAWACO, cooperation with programs and plans to reduce water loss along the grid.

45. On the long term the project is identified as a basic need to promote the construction of infrastructure for the new urban area west of the city.

46. The Project will only rehabilitate existing facilities (water supply network). The initial assessment did not identify any outstanding environmental issues related to the operation of these facilities. All mitigation measures defined in Table 32 pertaining to handling of chemicals, waste storage/stockpile, and / other storage in existing facilities will be followed.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Location

47. Geographically, Hanoi city locates in the north-west area of the Red river delta from 20053' - 21023' North latitude, 105044' - 106002' East Longitude, adjacent to Thai Nguyen and Vinh Phuc provinces in the north, Ha Nam and Hoa Binh provinces in the south, Bac Giang, Bac Giang and Hung Yen provinces in the east, Hoa Binh and Phu Tho provinces in the west. Hanoi's natural area is 3'344.605 km².

48. Hanoi's terrain gradually decrease from the north area to the south area and from the west area to the east area. The average altitude is from 5 to 20 m in comparison with the sea water level.

49. Hanoi's terrain can be classified into three main groups: plain, midland and moutainous region.

50. Plain region accounts for 54.5% of the natural land area, along the banks of Red river, Day river and Tich River. Despite of being plain region, its altitudes change a lot, from 1.0 to 11.0 m in general. The plain region is classified into two groups as following:

- Plain region with low altitude: From the south area of Red river under old Hanoi, this region is the plain region with low altitude. Its altitude gradually decrease from +9.5 (Hanoi's centre) to (3.5-1.5) m (Thuong Tin). This region has many lakes, ponds, swamps and river, channel. This region is the residential area with crowded population of the new Hanoi.
- Plain region with high altitude: from the north area of Red river under old Hanoi to Me Linh and a part of the old Ha Tay province. This region is the plain region with altitude of +8.0 m - +15.0 m. Terrain of this region slopes gently, turning into terraced fields and divided by small rivers and streams.

51. Midland and low mountainous region: are mainly from the old Ha Tay province to Soc Son province. This region has the terrain of low hills and mountains, its altitudes are from 30 – 300 m, mainly in the low regions of Ba Vi district, high regions of Thach That, Quoc Oai, My Duc, Chuong My districts, Son Tay and Luong Son towns. This region has many limestone moutains and caves. Because the terrain of this region slopes gently and the empty area is large, soil is usually eroded strongly. Besides, other small midland areas are the hilly areas of Soc Son, Hoa Lac of the old Hanoi.

52. Mountainous region: the mountainous regions with high moutains are mainly in Ba Vi, the altitudes are over 300 m, the highest altitude is 1296 m. This region slopes very much, accounting for 54% of forestry land area of the old Ha Tay province.

53. In terms of geography and the project terrain, the geographical structure in Hanoi region is relatively complicated, belonging to the zones of Red river, Ninh Binh and the low regions in Hanoi of region of curving edge of north Vietnam. The geographical structure includes decomposited rocks, sediments, magma, aging from Paleoproterozoi to the Fouth. The geographicla situation in this region changes from Hanoi to the north and to the west-north, pressure force R > 1.5kg/cm². from Hanoi to Phu Ly, the pressure force of the ground is low (R < 1.5kg/cm²), so when building, it will be necessary to treat the basement.

54. More precisely, the project will be laid in the following areasThe Hoai Duc district locates in the west in Hanoi city from North Latitude 21004', East Longitude 105043', its area of 82.67 km², adjacent to

- Dan Phuong district in the north.
- Quoc Oai district in the west.
- Ha Dong district in the south.
- Tu Liem district in the east.

55. The geomorphological location of the district is in the intermediate area between the plain region and moutainous region, including three regions: hilly/mountainous region, plain region and alluvial region. The district has some mountains: Voi mountain, Vua Ba mountain, Thay mountain, Hoang Xa limestone mountain and the alluvial delta with the average altitude of 5 m.

56. The Quoc Oai district locates in the west in Hanoi city, about 20 km from Hanoi centre, from 20054' to 21004' North Latitude; 105030' - 105043' East Longitude, its area of 147.01 km², adjacent to:

- Dan Phuong and Hoai Duc districts in the east.
- Hoa Binh province in the west.
- Chuong My in the south.
- Thach That and Phu Tho districts in the north.

57. Quoc Oai district is the intermediate area between the mountainous region and the plain region, being divided by canal system, so the district has the most complicated features of projects locations.

58. The Thach That district locates in the north-west in Hanoi city, from 20058' to 21060' North Latitude; from 105027' to 105038' East Longitude, its area of 202.5 km², adjacent to:

- Phuc Tho district in the north.
- Phuc Tho and Quoc Oai districts in the east.
- Quoc oai district and Ky Son district (Hoa Binh province) in the south.
- Ba Vi district and Son Tay town in the west.

59. Thach That district is the intermediate area between the mountainous region, the midland region in the north and the plain region. In general, the altitudes decrease gradually from the west to the east and are divided into two main groups:

- Half mountainous half plain area with the average altitude of 10 m - 15 m. The geological structure of this area is mainly gravelly soil generated from the weathered rocks and laterite layers with depth of 20 – 50 cm.
- Geomorphological features of the area include areas that are rather even and flat with an average altitude range between 3 - 10 m on the left bank of Tich River. There are many low areas and small lagoons in this district.

60. The town of Son Tay with its area of 113.46 km², 42 km from Hanoi capital in the west-northwest, from 21008' North Latitude; 105030' East Longitude, adjacent to:

- Red river and Vinh Phuc province in the north.
- Ling river and Thach That district in the south.
- Phuc Tho district in the east.
- Ba Vi district in the west.

61. The main features of this area are rather even and flat, the average altitude ranges between 10.5 – 17.0 m. Noticeable features are mainly hilly areas slopping gentlly and small valeys. The land in this region is mostly well drained. The geological structure in this area is convenient to construct. Soil layers have a good force resistance capacity according to the construction documents.

B. Meteological conditions

62. Construction sitestThe meteological conditions of the various sites correspond to the ones found at the Lang meteorological station in Hanoi located approximately 30 km away from the BPS construction sites

63. The following tables show the monthly average temperatures, humidity, rainfalls and sunshine hoursin Hanoi in during the period 2007 - 2011.

Table 7 Climate annual statistic in Hanoi and Son Tay, Period 2000 - 2006

(Source: overall planning for construction in Hanoi till 2030 and vision to 2050)

Climate features	Station in Hanoi	Station in Son Tay
Average temperature in year (°C)	23.4	23.4
Highest temperature (°C)	42,8	42.5
Lowest temperature (°C)	2.7	3.5
Yearly average humidity (%)	83	84
Yearly average rainfalls (mm)	1680	1773
Total sunshine hours	1640	1699

64. The clear feature of the climate in Hanoi is the strong variation in temperature, humidity, rainfall and sunshine hours between the hot season and the cold season. There are four distinctives seasons in Hanoi. The hot season lasts from May to September, accompanied by heavy rains. During that period, the hottest months are June and July where the average temperature is around 30.9°C. At the opposite, the cold season lasts from November to March with the coldest month being January with an average temperature of 12.8°C. The two intermediate seasons are in April and in October. The unpredictable change in climate is the typical feature of the climate in Hanoi because of wind and particular climate conditions for each season. The average wind direction is North-East.

Table 8 Monthly average temperatures in Hanoi, Period 2007 – 2011

(Source: Vietnam's statistics Office)

Year	Average temperatures (^{o}C)											
	1	2	3	4	5	6	7	8	9	10	11	12
2007	16.9	21.9	21.1	23.4	27.3	30.2	30.4	29.2	27.2	25.8	21.4	20.4

2008	15.2	13.8	21.4	24.7	27.6	28.6	29.4	29.0	28.3	26.5	21.4	18.4
2009	16.0	22.5	21.0	24.7	27.1	30.3	29.6	29.9	29.1	26.8	21.9	19.9
2010	18.1	20.9	21.9	23.5	28.7	30.9	30.7	28.6	28.7	25.7	22.1	19.4
2011	12.8	17.7	17.1	23.8	27.2	29.5	29.9	28.9	27.5	24.5	23.9	17.4
Average	**15.8**	**19.4**	**20.5**	**24.0**	**27.6**	**29.9**	**30.0**	**29.1**	**28.2**	**25.9**	**22.1**	**19.1**

65. The highest humidity in Hanoi is usually in March and April every year. The lowest humidity is usually in November and December when North-East monsoon wind blows over the continent of Vietnam. In some day, the highest humidity reaches 100 %.

Table 9 Monthly average humidity in Hanoi, Period 2007-2011

(Source: Vietnam's Statistics Office)

Year	Average humidity (%)											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
2007	69	81	88	79	75	77	78	81	81	77	67	77
2008	80	72	82	84	79	81	79	83	80	80	76	75
2009	72	84	82	82	81	74	79	78	76	75	66	73
2010	81	80	78	85	81	74	74	82	79	70	71	77
2011	71	83	80	80	76	80	77	80	80	78	76	67
Average	**74.6**	**80.0**	**82.0**	**82.0**	**78.4**	**77.2**	**77.4**	**80.8**	**79.2**	**76.0**	**71.2**	**73.8**

66. Hanoi has the typical climate of the monsoon and tropical region. It is hot and rainy in Summer. In Winter, it is cold and drizzling. Due to impacts from the sea, Hanoi has a relatively high air humidity content and averages 114 rainy days every year. The month with the highest rainfall is July. In the north area of Vietnam, Hanoi is hit by 8 to 15 storms every year. The recorded floods in the history were impacted by mainly storms or the circulation of storms.

Table 10 Monthly average total rainfalls in Hanoi, Period 2007-2011

(Source: Vietnam's Statistics Office)

Year	Rainfalls in months (mm)											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
2007	3	25	29	98	118	211	286	330	388	145	5	21
2008	27	14	20	122	184	234	424	305	199	469	259	11
2009	4.9	8.0	49.1	74.3	229.0	242.4	550.5	215.7	154.,6	78.8	1.2	3.6
2010	80.9	8.1	5.8	55.6	149.7	175.4	280.4	274.4	171.8	24.9	0.6	11.6
2011	9.3	17.5	105.8	42.0	149.0	395.5	254.4	313.2	247.6	177.6	31.8	51.5
Average	**25**	**14.5**	**41.9**	**78.4**	**165.9**	**251.7**	**359.1**	**287.7**	**232.2**	**179.1**	**59.5**	**19.7**

67. Hanoi city receives abundant solar radiation in 365 days in the year, in general temperature of the climate in Hanoi is high.

Table 11 Monthly average of total sunshining hours in Hanoi, Period 2007-2011
(Source: Vietnam's Statistics Office)

Year	Sunshining hours in months **(hours)**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
2007	69	75	25	88	146	218	209	157	129	107	181	58

2008	63	26	68	73	143	116	144	124	123	92	148	114
2009	104.7	74.9	50.1	85.6	142.8	166.6	142.9	171.7	132.3	125.0	183.3	78.1
2010	34.2	94.2	53.0	51.1	124.8	158.5	180.5	121.3	146.1	108.6	104.4	79.1
2011	4.0	37.9	15.0	57.0	138.5	127,2	151.4	151.0	102.7	76.8	106.5	95.6
Average	**55.0**	**61.6**	**42.2**	**70.9**	**139.0**	**157.3**	**165.6**	**145.0**	**126.6**	**101.9**	**144.6**	**85.0**

C. Climate change

68. Expected climate change impacts in the North of Vietnam include a potential increase in frequency and/or intensity of tropical cyclones; an observe constant increase in rainfall since 1960 and the run-offs that comes with them; an expansion in flooded areas and a rise in annual flood levels. Although the intergovernmental panel for climate change (IPCC) does not forecast any great changes in the timespan of the project 2016-21 but more in the years 2060 to 2090, punctual events due to climate change, notably recurrent flashfloods could affect pipes crossing under low laying bridges. As such, climate change impacts will be considered during detailed design, especially bridge crossing where pipes should always be put on the downstream side where possible. Also, drought events aggravated by climate change could also occur during the same period. Resource from the Da River would be really hard to decrease to a point of endangerement of the Da River WTP. In addition this project takes its resources from a large body of water and from a supplier, Vinaconex, which has plans to upgrade water availability.

69. Measures to protect infrastructures from disaster risk will be identified during the detailed design.

70. The above measures will contribute to the safety of water supplies during such events. This will also help to implement the Water Safety Plan to be implemented.

71. Preliminary Climate Risk Screening Checklist has been filled and is presented in a separate document. Results from this screening shows low risk for the Project.

D. Hydrological Conditions

72. According to the overall construction planning in Hanoi capital, Tich River has the basin area of 1350 km², from Tan Vien Mountain (Ba Vi). Section from Dam Long to Son Tay town of Tich River flows from Northwest to Southeast, having the big curve then pouring into Da River at Ba Tha. Tich River has the width of 10 – 150 m and a length of about 110 km, the river is bendy, the river slopingness is 0.8 – 1%. The basin area of 850 km² in the right of the river, under the east side of Ba Vi Mountain has high mountain, low hill and plain. The left bank basin area of about 500 km² is mainly broad plains.

73. Tich River has 25 branches of river of Class I, in which the right bank has 16 branches with the basin area of 910 km², flowing directly into the mainstream. Some large branches of the river were made into reservoir to regulate the flow of the river in order to serve the national economic sectors including the agricultural sector in locations like Suoi Hai and Dong Mo. Though the width of the Tich River is narrow; the shelf of the river is rather wideaveraging about 2 to 3 km, and even 5 to 6 km at some places. This area has many hills, hard soil and small erosion. The slope of the river is feeble; the slopes of its branches can be important averaging between 10 to 20 m/km with springs dropping at 30 m/km. Therefore, the flood going through to Tich River by its branches can be quick and strong. Nonetheless, the accumulated strength of those incoming flows do not conjugate to force the flow of Tich River. Geographical disposition

make the Tich River meander in its wide shelf and the flow in branches of Tich River duplicate regularly along its course. The recorded floods in history occurred at Suoi Hai in September, 1962, with measured flow rate of Qmax = 945m³/s, but at Ba Tha the measured flow rate is only 210 m³/s.

74. Currently, Tich River water is being used to irrigate for the argricultural sectors in Thach That, Quoc Oai, Son Tay town and Ba Vi district.

E. Hydro-geological conditions

75. The underground in Hanoi city has an empty layer containing water, the fissures layer containing water and karst features.

76. The empty layers containing water in the ground include the empty layer containing water in Holocene sediment (qh) and the empty layer containing water in Pleistocene sediments (qp).

77. The fissure layers containing water include fissure layer containing water in Neogene sediment (n) and fissure layer containing water in Jurassic sediments, (j1- 2), fissure layer containing water in the sediments of Boi Rive (t2-3sb); Nam Tham (t2nt), Karst fissures in Dong Giao sediment (t2dg), fissure layer containing water in early Triassic sedimentary of Na Khuat (t2nk); fissure layer containing water in middle Triassic sedimentary of Khon Lang (t2kl), fissure layer containing water in sedimentary of Tan Lac (t1tl); fissure layer containing water in early Triassic sedimentary of Vien Nam (t1vn); fissure layer containing water creating Neoprotezozoi-Cambrian, a number of flowing rivers (np-ε1), fissure layer containing water Proterozoic old decomposited rock (pr).

78. The underground water resource supplying to the old Hanoi lies between the layers of alluvial sedimentation of Red River Delta, built up continuously that created Red river delta in the direction from northwest to southeast, with width covering from the hills near Soc Son to the hills near Son Tay. The layer of sediment has the depth of about 80 m along central axis of the delta and has the gradually shallow depth in the direction toward the westsouth.

79. The process of exploiting the underground water in old Hanoi region has been started more than a hundred years ago, causing the low level of water in some main wells. Water levels in the surveyed wells were 20 m below sea level. This water level depended very much on the water level in Red River.

80. A typical characteristic of the groundwater source in old Hanoi region is that the quality of the underground water is very inconsistent. The quality of the underground water is gradually low in direction from the north area to the south area of the city. Especially, some indexes of ammonium and organic contamination tend to be higher and the highest levels are found where wells are gathered close together in the south of Hanoi, for example Phap Van, Tuong Mai and Ha Dinh. Meanwhile, these indexes of the quality of the underground water in some water plants in the north in Hanoi for example Ngoc Ha, Mai Dich, Yen Phu, Cao Dinh, Luong Yen, Ngo Si Lien show much lower contamination levels.

81. The concentrations of ferric and manganese ions in the underground water in old Hanoi region are also non-homogeneous, low in the bunch of wells of Mai Dich, Ngoc Ha, Ngo Si Lien) to high in the bunch of wells of Cao Dinh, Ha Dinh Tuong Mai, Phap Van. The concentrations of manganese ion in the raw water in bunch of wells are also different, low in bunch of wells in

areas of Yen, Ha Dinh Tuong Mai, Phap Van; and high in bunch of wells in areas of Cao Dinh, Ngoc Ha.

82. Apart from the old regions of Hanoi, Ha Dong and Son Tay, the other areas have not been surveyed in detail on a large scale; only surveying in detail on a narrow scale at towns where water supply stations with small-scale infrastructures were present.

83. In areas of Thach That district, Quoc Oai, Hoai Duc, the underground water can be exploited from the layer of Pleistocene (QL-m) and the fissure layer containing water at the small and medium scale.

F. Natural Hazards

84. Vietnam has been classified as a low seismicity region. However, some moderate earthquakes occurred in Vietnam. 90% of Earthquakes have taken place in the northwestern Vietnam. In the other regions, there was not any earthquake of magnitude larger than 5.5. A Seismological Station is located in Hanoi.

85. Regarding flood risks, as indicated above, Hanoi has the typical climate of the monsoon and tropical region. The recorded floods in the history were impacted by mainly storms or the circulation of storms.

86. According to a recent survey[2] , most of Hanoi's flat areas are 0-4m and submersible. Effective level of inundation increases gradually from two sides into the centre and from the north to the south, consistent with obliquity and terrain characteristics of Hanoi City.

87. Some areas in the west, southwest and south of the city (in districts: Chuong My, My Duc, Ung Hòa, Thuong Tín,Phú Xuyên) are severely affected by flood with deeply inundated areas; inundation level is at danger level of about 2-4m.

88. The districts in the south of Hanoi have the most vulnerable areas, such as the low lands: Chuong My, My Duc, Ung Hòa, Thuong Tín, Thanh Oai districts.

89. The districts located in the project area, Hoai Duc, Quoc Oai and Thach That are not specifically vulnerable.

[2] Nguyen Hieu, Do rung Hieu, Dang Kinh Bac, Doàn Thu Phuong (2013) Assessment of Flood Hazard in Hanoi City

G. Current status/situation of the environment in the proposed areas to build the project

90. Table below shows the current status/situation of the environment in the proposed areas to build the BPS and the clean water transmission pipelines of the project.

Table 12 Environmental condition in the construction sites item works

Identification number of infrastructure	Locations of transmission pipelines/ BPS	Overall current status/situation	Environmental sensitive areas
Section No. 1A; 1B và 1C	800-1200mm diameter pipeline along National Highway No. 70, from Nhon to Thang Long avenue to Ha Dong to Van Dien	Section from Thang Long to Nhon: narrow road in general, especially 5 m in wide at some places with residential areas in both roadsides. There is no pavement at some sections. Besides, there are the lines of so big nacre, when building, it should avoid impacting to the roots of trees, falling trees. Section from Thang Long avenue to Van Dien: section in Tay Mo, Dai Mo (for example Cho Chieu market street: narrow road, narrow pavements, residential areas along with both roadsides, lines of nacre on both roadsides at some places; Section from Ha Dong district crossing main roads (Nguyen Trai) to Cau Buou: large road, thinly populated on both roadsides	Sections running through crowded residential areas (residentials' houses along with both road-sides) including Xuan Phuong, Ngoc Mach, Tay Mo, Dai Mo, Van Phuc, Phung Hung road – Ha Dong district, Xa La urban area – Cau Buou. Pagodas include Ngoc Mach and Huong Do. Big hospitals include: Military Hospital 103, second branch of K hospital, National Burn Hospital. Flower gardens include Nguyen Trai statue garden, Van Dien cemetery park. Schools and institutions include Hanoi Industrial Technology School/College, Phan Trong Tue vocational training college of mechanics, electrics and rural development. Crossing points with main roads include cross-roads with national highway 32, provincial road 442, Thang Long avenue Le Van Luong road extended, Nguyen Trai road. Cross-roads with railway is at the place far 1500 m from Thang Long avenue in the north. Bus stops include Van Dien bus stop. Flyovers and bridges running over ditchs include flyover, 500 m from Thang Long avenue in the north, Trien Bridge flyover, Van Phuc Bridge flyover, Ha Dong Bridge flyover, bridge runing over ditch Ha Dong – Xa La urban area, Buou Bridge, To Bridge, Hoa Binh Bridge
Section No. 2	400 mm diameter pipeline along road from Lang to Hoa Lac to Van Canh to National Highway No. 32 (Le Trong Tan extended)	Some sections have been cleared the ground and invested 4 urban areas. Some remaining sections have been handed to Investor but not yet revoking land. Hoai Duc district's People's Committee will the investor of clearing the ground	Sections running through crowded residential areas (residentials' hourses along with both roadsides) include National Sport Training Centre, Di Trach. Spiritual works includes Muc Dong pagoda, Lai Yen cemetery. Crossing points with main roads include cross-roads with national Highway 32 at Nhon, provicial road 422, Thang Long avenue.

Identification number of infrastructure	Locations of transmission pipelines/ BPS	Overall current status/situation	Environmental sensitive areas
Section No. 3	600 mm diameter pipeline along provicial Road 422B and Road 422 from National Highway No. 70 to Cat Que to boundering line 4	Section of Road 422B is 3.0 km long, has been approved and implemented since August, 2008 under Decision No. 238/QĐ-UBND by Hoai Duc district People's Committee. Currently, remaining 4 sections of this road is not implemented, bad and narrow road, needing to clear the ground	Sections running through crowded residential areas (residentials' houses along with both roadsides) include Xuan Phuong, Hau Ai (Van Canh), Son Đong. Pagodas: Hau Ai pagoda and Vuc pagoda (Chùa Hậu Ái, chùa Vực). Bridges: Hau Ai bridge and Dai Tu bridge. Schools: Van Canh Secondary School
Section No. 4	600 mm diameter pipeline along national highway no. 32 from Nhon to Phung	Improved road according to the planning	Sections running through crowded residential areas (residentials' houses along with both roadsides) include towns of Nhon, Lai Xa, Tram Troi, Duc Thuong and urban areas of Kim Chung, Di Trach, Lideco. Crossing points with main roads include cross-roads with provicial NATIONAL HIGHWAY NO. 70 at Nhon, cross-road with road leading to National Sport Training Centre, cross-road with road from Tram Troi to Song Phuong on Thang Long avenue.
Section No. 5	400 mm diameter pipeline along provicial Road 422b and inter-commune road from Tram Troi to An Khanh over-bridge	Section from An Khanh over-bridge to Lai Yen has been invested, the rest is in Planning till 2020. Section from Tram Troi to Son Dong crossroad has the residential areas on both roadsides	Sections running through crowded residential areas (residentials' houses along with both roadsides) include towns of Tram Troi, Lung Kenh (Duc Giang), Son Dong. Crossing points with main roads include cross-roads with national highway 32 at Tram Troi, cross-road with provincial road 442, cross-road with Thang Long avenua. Bridges: Cho Đong Bridge... Schools: Hoai Duc A Secondary School, Duc Giang Primary and Secondary Schools
Section No. 6	800 mm diameter pipeline along boundering road 4 from national Highway No. 32 to national Highway No. 6	Planning line	According to detail planning on No. 4 boundering line – Hanoi Region had been approved by Government under Decision No. 1287/QĐ-TTg dated July 29, 2011, this road will be completed by 2018
Section No. 7	600 mm diameter pipeline along provincial Road 419 from North Quoc Oai to Phuc Tho	Asphalted road	Sections running through crowded residential areas (residentials' houses along with both roadsides) include Lien Quan town. Crossing points with main roads include cross-roads with Thang Long avenue and road to Tay Phuong pagoda. Bridges: 03 bridges of which two bridges in the area of Phung Xa commune, one is Lieu bridge near entrance of Tay Phuong pagoda

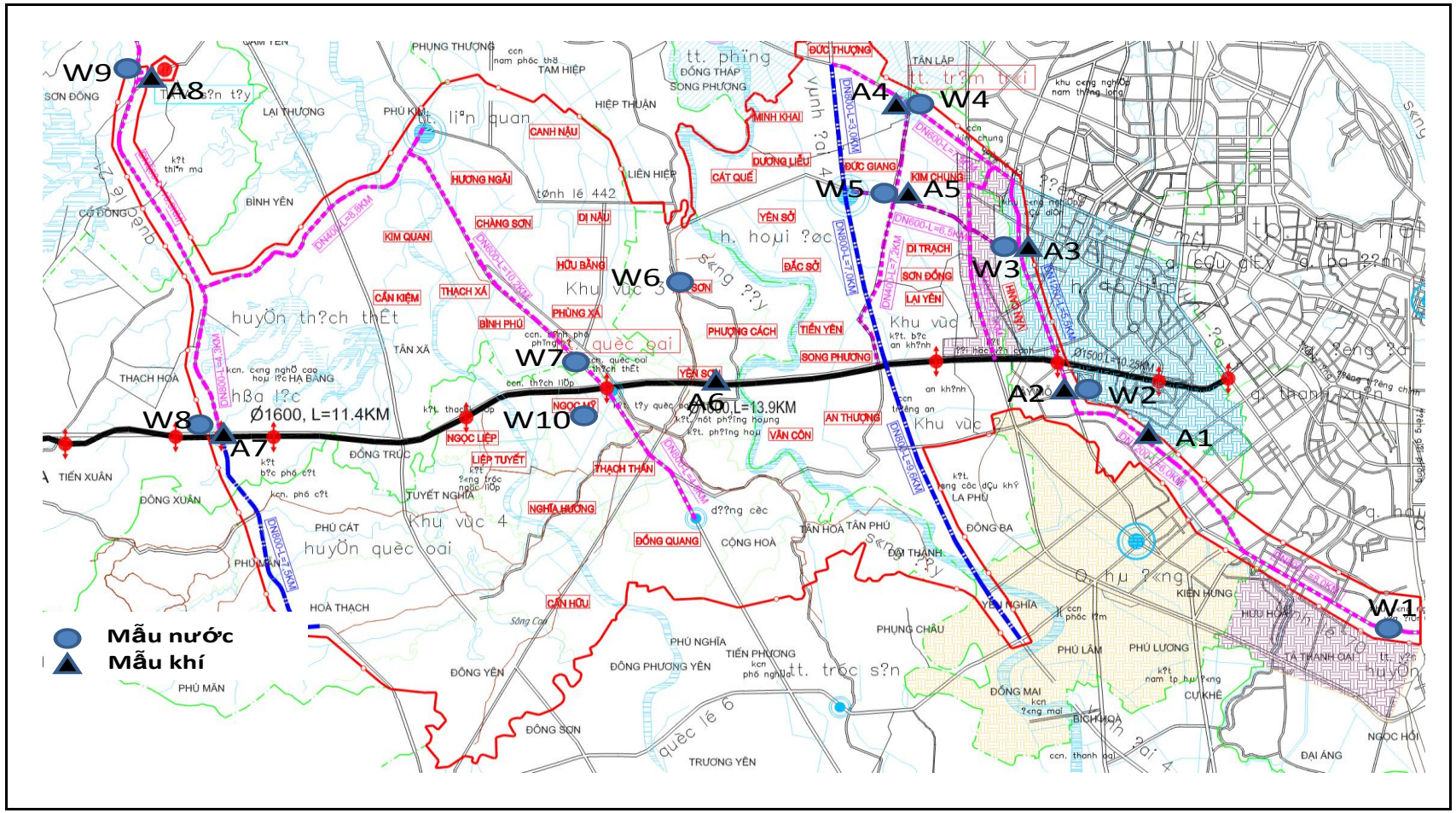
Identification number of infrastructure	Locations of transmission pipelines/ BPS	Overall current status/situation	Environmental sensitive areas
Section No. 8	400 mm diameter pipeline along provincial Road no. 420 to Canh Nau, Di Nau	Asphalted road	There's no sensative place
Section No. 9	600-800 mm diameter pipeline along national highway no. 21 from T-junction Hoa Lac to Son Tay, Hospital No. 105	Section of transmission pipelines along national Highway 21, receiving Da River clean water from main transmission pipeline along withThang Long avenue. This section of transmission pipeline runs to Son Tay pressure boost pumping station, then to Son Tay town	Sections running through crowded residential areas (residentials' houses along with both roadsides) include sections of T-junction of national Highway 21 and road to Ba Vi National Park, and section near T-junction of old Hoa Lac. Crossing points with main roads include cross-roads of Thang Long avenue, provicial road 420 and road to Ba Vi National Park. Bridges: Hoa Lac bridge, Dong Mo bridge, Qua bridge and Quan bridge.
Section No. 10	400 mm diameter pipeline along Thang Long avenue from righ bank of Tich River to Ngoc Liep People's Committee	This section of pipelines is along with the righ-side of the road in the direction from Hoa Lac to Hanoi, 2 m from road-side	There's no sensative place.
Son Tay BPS	In the right of national highway 21 in the direction from Hoa Lac to Son Tay, at Milestone No. 7, 50 m from asphalted roadside.	The current area is farming land, there are some graves in this area of 5000 m^2. air environment is good	Two households on the entrance to the pumping station will be removed partly from the residential area to enlarge the entrance to the working site. Some other households will be impacted due to losing the farming land or relocating graves of their relatives.

91. To assess the current status/situation of the quality of the environment in the construction sites, Consultant has surveyed at site and collecting sampple to test the ground environment (samples of noise/sound, air and water) on December of 25th, 2012. The location of sampling is described in the following Figure and Table.

Table 13 Description of locations of collecting samples to analyse the quality of general environmental condition (Baseline)

Type of sample	Number of samples	Symbol of samples	Description
Water	**10**	**W1**	Sampling the underground water at drilled wells at water supply station in hamlets of Huu Tu, Huu Hoa, Thanh Tri district (near Huu Hoa bridge on Nhue river).
		W2	Sampling the underground water at drilled wells at water supply station in hamlets of Nga, Dai Mo commune, Tu Liem district.
		W3	Sampling the underground water at drilled wells at the residential houses in crossing point of provincial NATIONAL HIGHWAY NO. 70 and provincial Road 442, Van Canh commune, Hoai Duc district.
		W4	Sampling the underground water at drilled wells at the residential houses in cross-road of Tram Troi, Zone 7 Tram Troi, Hoai Duc district.
		W5	Sampling the underground water (treated) at drilled wells at the residential houses in cross-road of Son Dong, Hoai Duc district.
		W6	Sampling the surface water at the pond of Thay pagoda, Quoc Oai district.
		W7	Sampling the underground water (treated) at drilled wells at Ben Do Hamlet, Ngo Sai commune, Quoc Oai district.
		W8	Sampling the underground water (treated) at drilled wells at the residential houses in area near Lang – Hoa Lac viaduct on national Highway 21.
		W9	Sampling the underground water at drilled wells at the residential houses in Son Dong, Son Tay from Milestone No. 7 to Son Tay on national Highway.
		W10	Sampling surface water at Lotus pond, Ngoc My communal house, Quoc Oai district.
Air and micro climate	**8**	**A1**	Sampling the air at the entrance of Military Medical Academy.
		A2	Sampling the air at the entrance of the cultural house of Ngang hamlet, Dai Mo, Tu Liem district.
		A3	Sampling the air at the entrance of Ha Tay Mechanical Joint-Stock Company.
		A4	Sampling the air at Crossroad Tram Troi, Hoai Duc district.
		A5.	Sampling the air at Crossroad Son Dong, Hoai Duc district, Hanoi city.
		A6	Sampling the air at Bridge 72 on Day river.
		A7	Sampling the air at Hoa Lac flyover (Lang-Hoa Lac bridge).
		A8	Sampling the air at Tan Phu, Son Dong, Son Tay.
Noises	**8**	Locations of sampling are the same to air samples'	

Figure 6 Locations of test sampling for environment quality (Baseline)



H. Current situation of the water environment

92. Three following tables show the results of testing the quality of water in the typical samples of the surface, underground and living water resources of the local residentials in the construction sites.

Table 14 Surface water sample test results at construction sites

Criterion	Unit	Result of testing		Maximum permitted level NS QCVN 08:2008/BTNMT Column A2
		W6	W10	
pH	-	8.84	8.76	**6.5-8.5**
TSS	mg/l	30	16	**30**
Cl^-	mg/l	24.1	17.37	**400**
NO_2^-	mg/lN	0.023	0.32	**0.02**
NO_3^-	mg/lN	4	5.74	**5**
NH_4^+	mg/lN	0.061	0.75	**0.2**
Cu	mg/l	0.1	0.1	**0.2**
As	mg/l	0	0	**0,02**
Cr^{6+}	mg/l	0.059	0.052	**0.02**
Cr^{3+}	mg/l	0	0	**0,1**
Fe total	mg/l	0.2	0.075	**1**
DO	mg/l O_2	10.5	11.45	**> 5**
COD	mg/l O_2	50	33	**15**
BOD_5	mg/l O_2	23	13	**6**
Coliforms	MPN/100ml	171	108	**5.000**

Note: Column A2 – used for the purpose of supplying the living water but must be applied the suitable treatment technology; and purpose of protecting the aqua-lives.

Table 15 Underground water resource samples test results at the construction sites

Criterion	Unit	Result of testing				Permitted level NS QCVN 09:2008/BTNMT
		W1	W2	W3	W4	
pH		6.99	7.18	7.02	6.83	**5.5-8.5**
Cl^-	mg/l	18.78	11.34	55.3	11.34	**250**
NO_2^-	mg/lN	0.007	0.004	0.006	0.004	**1.0**
NO_3^-	mg/lN	5.8	0.21	4.91	5.97	**15**
NH_4^+	mg/lN	5.3	3.2	3.51	6	**0.1**
Cu	mg/l	0.035	0.052	0.018	0.016	**1.0**
As	mg/l	0.001	0.0005	0.0002	0	**0.05**
Cr^{6+}	mg/l	0,037	0	0	0.019	**0.05**
Fe total	mg/l	2.71	2.45	1.61	2.76	**5**
Mn total	mg/l	0.085	0.162	0.73	0.09	**0.5**
COD	mg/l O_2	35	3	31	18	**4**
Coliforms	MPN/100ml	0	0	1510	0	**3**

Table 16 Actual water supply samples (residential homes) test results at construction sites

Criterion	Unit	Result of testing				Permitted level NS QCVN 09:2008/BTNMT
		W1	W2	W3	W4	
pH		6.99	7.18	7.02	6.83	**5.5-8.5**
Cl^-	mg/l	18.78	11.34	55.3	11.34	**250**
NO_2^-	mg/lN	0.007	0.004	0.006	0.004	**1.0**
NO_3^-	mg/lN	5.8	0.21	4.91	5.97	**15**
NH_4^+	mg/lN	5.3	3.2	3.51	6	**0.1**
Cu	mg/l	0.035	0.052	0.018	0.016	**1.0**
As	mg/l	0.001	0.0005	0.0002	0	**0.05**
Cr^{6+}	mg/l	0.037	0	0	0.019	**0.05**
Total Fe	mg/l	2.71	2.45	1.61	2.76	**5**
Total Mn	mg/l	0.085	0.162	0.73	0.09	**0.5**
COD	mg/l O_2	35	3	31	18	**4**
Coliforms	MPN/100ml	0	0	1510	0	**3**

93. In the countryside where there is no supply of clean water, the local residentials can drill wells at the low layer in the ground in order to use the underground water resource. If the surface water resource in the local area is polluted, the possibility of contamination by organic and foreign matters from the surface waters will be assured. Sen pond (Lotus pond) at the communal house of Ngoc My, Quoc Oai district currently supply a clean water resource to the whole hamlet. Currently, there are a lot of small pumps (about 200 pcs) to pump water to each household. So, households in this area are using the surface water resource for the living purpose.

94. The results of tested samples in the tables above show that amounts of BOD5 and COD in both the two surface water samples is higher than the permitted levels. Criterion of BOD5 is 2 – 4 times higher than the permitted level (see in the 1st Figure below); criterion of COD is 2.2 – 3.3 times higher than the permitted level. Heavy metal Cr6+ (2.6 – 3.0 times higher than the permitted level (see in the 2nd Figure below) and criterion of NO2- is 1.1 – 1.6 times higher than the permitted level (see in the 3rd below). especially, the concentration of NH4+ in sample W10 is 3.7 times higher than the permitted level; and the concentration of NO3- is 1.1 times times higher than the permitted level. The surface water sample W6 at the pond located in front of the gate of Thay pagoda has a concentration of suspended solid matters as high as the permitted level. From all assessment mentioned above, we can conclude that the surface water environment in the surveyed areas is polluted significantly by the organic matters, sediments and heavy metals. Causes of this situation might be the pollution from the production in the handicraft villages, the population growth and the urbanization process, and partly the activities of farming production.

95. Results of the four tested samples of the underground water in drilled wells in the construction sites (raw water, not treated) show that all four samples are contaminated with NH4+ at a concentration higher than the permitted level 32 to 60 times higher than permitted. Also, the COD in three out of four samples of underground water (W1, W3 and W4) is 4.5 to 9 times higher than the permitted level. This means that the underground water resource in the surveyed wells that supply water for the living purposes of the local residents is polluted.

96. So, we can conclude that the project to supply the Da River clean water to the construction sites will surely be a timely, appropriate and long-term solution in the fact that the

surface water resources, especially the underground water at the low layer in the ground, is polluting.

I. Current situation of the air environment and noise

97. In 8 locations of collecting samples, criteria of noise level, dust and gas wastes are highest at the location A1 (see the following Figure), location of collecting sample at the gate of 103 Military Hospital and Military Medical Academy in the important axis of the Provincial Road 70 linking to Ha Dong, to the National Highway 1A. The total amount of suspended dust/pollutant (TSP) in the baseline results is 1.5 times higher than the permitted level according to the National Standard QCVN05:2009/BTNMT. So, it will be necessary to pay a special attention such as taking measures like watering surfaces regularly, especially in dry and/or windy days and covering all material transport vehicle carefully when transporting through habited areas.

98. Location A8, point of collecting sample, in the proposed area to build the pressure boost pumping station. This location locates is the farming area, behind a row of the local residentials' houses facing the National Highway 21, in area of Milestone Km 7 if travel from Son Tay. Though the current situation of constructions of dust and gas wastes is not beyond the permitted level. However, when start the project, many items of the project for example pipelines, water tanks and the pressure boost pumping station will be built here in so long time duration. So, it will be necessary to take measures to cover and water when building in order to limit the bad impacts to the nearby row of the local residentials' houses.

99. Results of the tested samples and assessment of the situation of the air environment and noise in in the construction sites; date of sampling: 25/12/2012 is described in the two following Tables.

Table 17 Result of testing the quality of the air (sampling date: 25/12/2012)

Criterion of testing	Result of testing								QCVN 05:2009/ BTNMT
Sign of sample	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	
Time of sampling	8h	9h25	10h10	11h	11h35	13h40	15h15	16h05	
Co-ordinate of sampling	N 20°57'59'' E 105°47'24''	N 20°59'51'' E 105°45'06''	N 20°02'10'' E 105°44'17''	N 21°04'12'' E 105°42'27''	N 21°02'49'' E 105°42'14''	N 21°00'13'' E 105°39'45''	N 20°59'37'' E 105°31'27''	N 21°04'33'' E 105°30'07''	
Temperature (°C)	18.0	18.2	20.3	25.2	26.8	24.6	24.1	23.6	
Humidity (%)	58.3	59.8	52.8	44.2	42.4	47.6	50.8	49.4	
Speed of wind (m/s)	1.8	1.3	1.2	1.1	1.1	1.1	0.9	1.0	
Wind direction	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	Northeast	
NO_2 (μg/m³)	74.2	53.8	48.3	56.1	68.3	64.5	72.3	57.4	200
SO_2 (μg/m³)	51.7	45.1	41.6	46.7	52.4	54.3	61.7	54.3	350
CO (μg/m³)	4180	2978	1918	3437	2226	2185	3514	2278	30000
Total suspended particules (TSP) (μg/m³)	314	195	156	188	175	201	235	202	300

Note:

A1:Air sample collected at the gate of Military Academy.

A2: Air sample collected at the gate of the Cultural House in Ngang Hamlet, Dai Mo commune, Tu Liem district

A3:Air sample collected at the gate of Ha Tay Mechanical Joint Stock Company

A4: Air sample collected at Tram Troi crossroad (Hoai Duc)

A5: Air sample collected at Crossroad Son Đong, Hoai Đuc.

A6: Air sample collected at Bridge 72 – Day river

A7: Air sample collected at Flyover Hòa Lạc (Bridge Lang Hoa Lac).

A8: Air sample collected in Tan Phu, Son Đong - Son Tay

100. Regarding noise pollution, there are two levels of noise to be respected depending on the type of area the samples are taken. For instance, the sample A1, collected at the gates of the Military Academy and 103 Military Hospital in Phung Hung road (partly in the Provincial Road 70), according to the classification in the National Standard QCVN 26:2010/BTNMT, is in a special area where the noise should be kept below 50 dBA. This sample shows a noise level of 71.8 dBA, higher than the permitted level. This means that when the process of excavating trenches and installing pipelines is not implemented, the noise level is beyond the permitted level because this is an important traffic road linking Ha Dong district to the National Highway 1A. So, for this sensitive section as well as some other sensitive points for example at the sections/points of Hanoi industrial technology College, Phan Trong Tue Vocational Training School, whose fences and walls is near the Provincial Road 70, contractor must arrange the schedule of building out of the patients rest time as well as the students studying time.

101. For the 7 remaining samples (from A2 to A7), the locations of sampling are in the common areas (residential area) in the important traffic road sections including the Provincial Road 70, the National Highway 32, the Provincial Road 442 and the National Highway 21. values of the measured noise level in these areas are in the permitted level range for the common area (compared with value of 70 dBA of the national standard QCVN 26: 2010/BTNMT). Except that the value of the measured noise level in sample A6 in Thang Long avenue, the section near Day river, is 58.5 dBA, very much lower than the permitted level, other values of the measured noise level in Locations of A4, A5 and A7 are 69.8dBA, 68.2 and 68.5 respectively, or in the permitted level range.

102. When installing the transmission pipelines (at Locations of A2, A3, A4, A5, A7) and building the BPS (at Location A8), the noise level at the local area will surely be added by the construction machines, so the noise level might be beyond the permitted level in most areas. Therefore, the process of building the project must ensure the measures to protect the residents from noise pollution in terms of the transporting vehicles and the working time, especially limiting the working time from 21.00 to 6.00 should be monitored.

Table 18 Result of measured noise level (measuring date: 25/12/2012)

Criterion of testing	Result of testing								QCVN 26:2010/ BTNMT
Sample	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	
Time of sampling	8h	9h25	10h10	11h	11h35	13h40	15h15	16h05	6h - 21h
Co-ordinate of sampling	N 20°57'59'' E 105°47'24''	N 20°59'51'' E 105°45'06''	N 20°02'10'' E 105°44'17''	N 21°04'12'' E 105°42'27''	N 21°02'49'' E 105°42'14''	N 21°00'13'' E 105°39'45''	N 20°59'37'' E 105°31'27''	N 21°04'33'' E 105°30'07''	
The noise level (dBA)	71.8	64.1	66.7	69.8	68.2	58.5	68.5	65.3	70 dBA (in common area); 55 dBA (in special area)

Note:

A1:Noise sample collected at the gate of Military Academy.

A2: Noise sample collected at the gate of the Cultural House in Ngang Hamlet, Dai Mo commune, Tu Liem district

A3:Noise sample collected at the gate of Ha Tay Mechanical JSC

A4: Noise sample collected at Tram Troi crossroad (Hoai Duc)

A5: Noise sample collected at Crossroad Son Đong, Hoai Đuc.

A6: Noise sample collected at Bridge 72 – Day river

A7: Noise sample collected at Flyover Hòa Lạc (Bridge Lang Hoa Lac).

A8: Noise sample collected in Tan Phu, Son Đong - Son Tay

J. Ecologic and Social Environment of Affected Areas

103. According to current survey, the eco-system in the project area includes two types of agricultural ecosystem and aquatic ecosystem (in ponds, canals). In general, because the project area covers three suburban districts of Thach That, Quoc Oai and Hoai Duc – farming areas and is being planned into the industrial and urban parks, the eco-system is poor, not diversified, having no endangered species that should be protected.

104. Agricultural ecosystem: man-made ecosystem in suburban areas, having the following features:

- Flora: includes terrestrial various plant species of wild common plants and bushes and crop originated ones like rice, beans, peanuts and corn.. Aquatic plants: waterweeds, moss, algae, water hyacinth, duckweed, species of shrubs growing near the shore, water spinach, parsley, cilantro and other crops native nad non-native.
- Fauna: Mainly species such as rodents, birds (finches, kingfishers, storks, plovers and others ...), reptiles (such as lizards, chameleons, water snakes, ...), frogs, fish found in nature such as perch, tilapia, snake-head fish, carp, catfish, eels and species raised in ponds like tilapia, carp, carp grass carp, black and prawn shrimp. Insects predominate in number (crickets, locusts, grasshoppers, beetles ...) and various pests of rice and vegetables. Currently, human use of pesticides contribute to impair aquatic animals health.

105. Ecosystem of aquatic areas: the project area crosses the path of Nhue, Tich and Day River. This ecosystem is vastly affected by many industrial production enterprises of multiple sectors such as engineering, machine manufacturing, food processing, textile dyeing chemicals and many vocational villages in the areas of weaving, dyeing, food processing, etc… along with the flowing basin of the river system. Also, because the urbanization spreads rapidly and building water waste treatment facilities is not invested in satisfactorily, it leads to significant pollution in the water environment of Nhue river and Day river, and especially the section running through Ha Dong District receiving the majority of wastewater in Hanoi from Lich river. All factors above make the aquatic ecology of the river system Nhue, Day and Tich being very poor.

106. Aquatic animals mainly include species tolerating high levels of pollution, such as perch, catfish, eel, etc… but, these species are declining due to pollution and overfishing. Aquatic plants generally include algae, mosses, water hyacinth, duckweed and shrubs growing near the shore.

107. Regarding the BPS (see Figures 2 & 3 p10), it affects only agriculture land and graves. Installation of pipeline and network doesn't require any permanent land acquisition. Wherever possible, pipelines will be located under road bed and pavement to minimize the impacts on environment and on local residents;

108. In new expanded areas, the pipelines will be installed during the construction of the new roads to minimize impacts and land acquisition.

K. Economic conditions

109. In 2011, Hanoi's GDP was VND 80'952 billion. GDP growth rate was 10.14 %. Local budget capital for basic infrastruture was VND 31'653 billion. Total goods and service consumption was VND 32'497 billion. According to Hanoi's statistic figures, Hanoi's situation till 2011 is as following:

- Total revenue: VND 115'466 billion.
- Capital for investment and development: VND 193'587 billion.
- FDI capital: VND 825.7 million.
- Total retail sales earn: VND 283'974 billion.
- Total export value: USD 10'306 million.
- Foodware production: 1'332'000 tons.

110. Up to December, 2011, Hanoi had 689 primary schools, 586 secondary schools, 199 senior high schools, About 857 pre-schools, including 782 kindergardens and 22 nursery schools.

111. Hanoi has 88 schools from vocaltional schools to universities, of which, 34 are universities and colleges, 54 are vocational training schools. Hanoi trained almost all important sectors in the main institution being the Medical University, Hanoi National University, Hanoi University of Technology, Hanoi University of Architecture, Military Technology Academy, Foreign Trade University, Vietnam University of Fine Arts, National Economics University, Hanoi University of Education, University of Construction, and Transport University.

112. Hanoi currently has 577 communal clinic centres and 55 hospitals. Due to the uneven development, big hospitals in Hanoi, as well as in the north region, only focus in the inner part of Hanoi city. Vietnam-Germany Hospital, Bach Mai Hospital, Swedish Pediatrics Hospital and Obstetrics Hospital in Hanoi are all in overloaded situation. In addition to the state healthcare system, Hanoi also has a private healthcare system of hospitals and clinic centres.

113. According to figures from the local department of intellectural properties under Ministry of Trade and Industry, up to December, 2011, Hanoi had one high-tech industrial zone (Hoa Lac High-Tech Industrial Zone) and 17 industrial parks with total area of 5377.5 hectares. There is also 49 industrial clusters parks have total area of 2616 ha and 177 industrial locations which have a total area of 1330 ha. Many industrial parks and industrial clusters were built in 70s or 80sMany industrial clusters and industrial points currently do not have the drainage and waste treatment systems, polullting seriously the environment.

a. Economic conditions in the construction sites

(a) Hoai Duc district

114. Hoai Duc, an important entrance to Hanoi capital, has many important roads including Thang Long Avenue, National Highway 32, provicial road 442; provincial Road 423, boundering line Road No. 4 and residential areas. In recent years, Hoai Duc has both advantages and disvantages. according to the socio-economic planning in Hanoi capital till 2020, over half of Hoai Duc will be developped. After revoking the farming land, residential areas will grow up. With both advantages and disvantages, this big change will impact negativenegatively and positively to all local socio-economic sectors and the local residents behavior and customs.

a. Situation of development of industrial clusters:

Plan to develop the industrial clusters in Hoai Duc district, Phase 2006 – 2010 was approved by old Ha Tay PC under Decision No. 225/2005/QĐ - UB dated March 10, 2005 and adjusted under Decision No. 1646/QĐ - UB dated October 03, 2006, in which regulating the planning of seven industrial clusters with a total area of 310.11 ha and 12 industrial points with a total area of 140.58 ha. Currently, five industrial clusters with total area of 130.11 ha and 05 industrial points with total area of 78.15 ha have been implanted including industrial clusters of An Khánh (34.67 ha), Lại Yen (26.8 ha), An Ninh (8.52 ha), Truong An (10.8 ha), Lai xa (49.14 ha) and industrial points of La Phu (11.7 ha), La Phu extended (40.7 ha), Di Trach (10 ha), Đac So (6.28 ha) and Cau Noi - Vân Canh (9.47 ha).

b. Situation of development of vocational villages:

Hoai Duc district has 54 vocational villages out of 56 villages, of which, 11 villages were recognized by old Ha Tay PC. Those villages includes vocational villages of processing the agricultural products of Duong Lieu, Minh Khai and Cat Que, vocational village of weaving and confestionary sectors La Phu, vocational village of paint, fine arts and sculpture of Son Dong, vocational village of noodles of Cao Xa Ha; vocational village of producing and processing rice paper of Ngu Cau; vocational village of producing and processing the agricultural products and foodware of Luu Xa; vocational village of taking photo traditionally of Lai Xa, vocational village of civil building of Yen So, vocational village of metal processing of Dai Tu.

115. Although impacted by the economic recession, inflation, etc., in first half of year 2012, the economic situation of Hoai Duc still have a good growth rate. Total value of production is estimated to be VND 1788 billion, increasing by 6,6% in comparison with the same period of year 2011 of which, value of industrial production and construction is estimated to be VND 940 billion, increasing by 3.6%; value of trading and service is VND 678 billion, increasing by 12.4%; total food production is estimatedly 15279.2 tone, increasing 2.1% compared with the same period of 2011. The district has approved the commune's proposal for new rural development and Yen So commune's planning of new rural development.

(b) Thach That district

a. Agricultural sector:

Cultivating is still the important sector of the district and the main economic sector of many communes in the district. Rice culture is the main food crop. Cultivation area in 2008 was 8981.5 ha. The district has 2468.54 ha of forest land which are all part of actual and future exploitation.

b. Industrial sector:

State industrial enterprises in the district have been re-organized, creating many limited liability companies, joint stock companies. Up to late 2008, the district had 4074 industrial enterprises, employing 13 656 laborers.

The district has nine industrial vocational villages of which we found Phung Xa, Chang Son, Huu Bang, Canh Nau, Di Nau, etc… The products are mainly building materials, woodware, metal, textile and garment, forestry products processing, foodware, bamboo and rattan/palm.

c. Goods and service sector:

In addition to economic development in overall, economic sectors of trading and service is rather strong development, exploiting the potentiality of the district.

Markets in the communes in the district are the main places for goods exchange. These markets create a service network providing the daily consumption and production demand of the local residents in the district. Hamlets and villages also have small service points. The district has 2181 businesses and HHs doing business in the trading and service sectors, attracting 6473 laborers. Their business scope is very diversified and active.

d. Transport sector:

The district has three national highways including Lang – Hoa Lac highway (Thang Long Avenue), National Highway 21 and Nationa Highway 32; and three provincial roads (419, 420 and 446), which are convenient to develop the district's economy. But, inter-hamlet roads and inter-commune roads are generally narrow, not meeting the actual development standards in transport.

e. Situation of urban development:

The rules of the market creates the goods and service exchange places in residential areas with high population density. However, in terms of these criteria, the district has not been recognized yet as an urban area and the land management of the district is not yet implemented in an urban way.

Total value of production in Thach That in the first half of 2012 reached VND 1543.5 billion, reaching 51.2% of year planned target, increasing by 6.8% compared with the same period of the previous year. The structure of value of economic sectors is capital construction: 65.9%; business – service – tourism: 14.3%; agriculture – forestry – aquaculture: 14.8%. Total state budget revenue in the district reached 30,9 billion with 15,2%; total revenue of the district reached VND 419.8 billion, equal 71.9 % of year's estimated. The number of poor HHs decreased to 887, reaching 51% of year's planned target. The number of job created in 2012 is 2470, reaching 52.5% of year's planned target.

In terms of of education of the new rural developments, up to now, the district has ten communes where the students between 8 and 14 reached the expected criterias. The quality of education is constantly increased and the number of pupils and students at all level increased. The program of national healthcare is well implemented in the district and the quality of healthcare services has changed in the past years.

The socio-economic development goals of Thach That till 2020 and vision to 2030 are to take new and existing advantages of the district by mobilising the domestic resources and attracting and take advantages of the external resources in order to enchance the socio-economic development. The main goal is to try to raised Thach That into an urban center with a strong industry and service offer. There is also a vision to coordinate urban development while keeping producing high-quality safe agricultural products through urban ecological agriculture.

In terms of value of production in whole district, the average annual growth rate will be 15-16% in 2011-2015, 16-17% in 2016-2020 and 15.5 to 16. 5% in 2021-2030. The economic restructure in the district to 2020 will focus firston industry, secondly on

services and thirdly on agriculture. Then, the district's economic structure will gradually shift into structure of services - industry - agriculture to 2030. Educational targets are to have over 50% of shools reaching the national standard in 2015 and over 80% by 2020. The increase of the techinical trained worker rate target is place at over 55% in 2015 and 65% in 2020 and creating about 5000-5500 jobs every year. Many plans also exist to improve healthcare, reduce malnutrition.

According to the Master Plan of Hanoi and current situation of Thach That district, the district will divided into four economic regions including urban development region, agricultural development region, industrial region and agril-forestry development region.

(c) Quoc Oai district

116. In the past five years, the district has approved forty-nine projects occupying nearly 2000 ha. Those projects mobilized the investment capital of VND 755.3 billion to build the district infrastructure, increasing by nearly VND 600 billion in comparisionwith the 2000 – 2005 period. Up to now, the district has nearly one hundred enterprises, three industrial clusters of Ngoc Liep, Yen Son and Quoc Oai town (now called as Quoc Oai - Phung Xa industrial park), equally harboring an increase in the value of small industrial production nearly VND 130 billion in 2009, increasing by VND 26.6 billion in 2005. The value of industrial production and construction in 2010 reached VND 1346 billion, increasing by 3.1 times compared with 2005.

117. Land for industrial development is expanding and equally shrinking agricultural lands.. To ensure the social welfare, solving the employment for the farmers who have lost farming land, Quoc Oai district officials focused on the agricultural development in the direction of cultivating the valuable products in order to raise their income on each hectare of farming area. Planning high-value agricultural production region including the lean pig breeding model in Can Huu commune (Quoc Oai); building the safe vegetable cultivating region with over 310 ha in communes adjacent to Day river; implementing the high-tech industrial project with 116 ha in Dong Quang commune and focused bredding model according to the industrial procedure with area of nearly 88 ha (reaching value of VND 200 billion/ha). Many traditional sectors including sector of processing the agricultural products in communes of Tan Hoa and Cong Hoa, sectors of producing rattan and knitting bamboo in communes of Nghia Huong, Ngoc My and Tuyet Nghia for instance have been maintained and developed by the district. Taking adavantages of having many transport roads running through the district in order to develop business, service and tourism, investing in the repairment/amendment and restoration of system of the historic relics and beautiful sites in order to attract more tourists.

118. With these results, the district has rather good infrastructure, up to now, the infrastruture conditions of the district for example schools, clinic centre, working office of communes and townshad developed creating favourable conditions for the socio-economic development and a new face of the rural areas in Quoc Oai district.

119. In the first half of 2012, Quoc Oai district has approved proposals to build the new rural area and detail planning of eight communes in phase 1, the district has also instructed the twelve remaining communes to implement the approved proposal and make the detail planning. The district is planning to invest and build or upgrade five markets in the rural areas and implement the change of Buong market management model.

L. Social conditions in the project area

120. The first table below shows the population situation in 2011 of three districts of Hoai Duc, Quoc Oai and Thach That. The second table shows figures on the poor HHs and the poor household proportion of each commune in each area of the project in 2011.

Table 19 Population of communes/towns in the construction sites, 2011

No.	Name of towns and communes	Number of HHs	Number of groups	Population
Hoai Duc district				
1.	Tram Troi Townlet	1429	7	4829
2.	Đuc Giang commune	2957	4	12229
3.	Son Đong commune	2086	11	8673
4.	Lai Yen commune	2520	4	7107
5.	Van Canh commune	2134	3	8664
6.	Đuc Thuong commune	2679	8	10659
7.	Kim Chung commune	2843	4	12255
8.	Di Trach commune	2.072	6	6722
9.	Yen So commune	2503	9	9860
10.	Đac So commune	1120	6	4102
11.	Minh Khai commune	1364	7	5693
12.	Duong Lieu commune	3094	14	13093
13.	Cat Que commune	3228	10	16274
14.	Tien Yen commune	1520	2	6350
15.	Song Phuong commune	3174	6	12782
16.	Van Con commune	3107	8	12674
17.	An Thượng commune	3612	5	14321
Thach That district				
18.	Huu Bang commune	3403	9	16364
19.	Phung Xa commune	2733	9	12067
20.	Thạch Xá commune	1670	9	7408
21.	Binh Phu commune	2140	9	11400
22.	Kim Quan commune	1972	11	7567
23.	Chang Son commune	2145	7	9112
24.	Huong Ngai commune	1959	9	8227
25.	Canh Nau commune	2717	11	14357
26.	Dị Nau commune	1600	6	7055
27.	Can Kiem commune	2079	6	8959
Quoc Oai district				
28.	Quoc Oai town	3299	5	14000
29.	Ngoc Liep commune	2070	4	7951
30.	Ngoc My commune	3024	2	11707
31.	Đồng Quang commune	3542	3	14289
32.	Thach Than commune	1678	4	6337
33.	Nghia Huong commune	1842	3	7452
34.	Liep Tuyet commune	1469	5	5558
35.	Yen Son commune	1972	3	7487
36.	Phuong Cach commune	1366	4	6009
37.	Can Huu commune	2131	6	10642
38.	Sai Son commune	4980	6	18464
Total		**91233**	**245**	**378699**

Table 20 Proportion of poor HHs in communes/towns in the areas of the project, 2011

No.	Communes/towns	Total number of HHs	Poor HHs	
			Number of poor HHs	Proportion (%)
Hoai Duc district				
1.	Tram Troi	1429	43	3
2.	Đuc Giang	2957	80	2.7
3.	Son Đong	2086	71	3.4
4.	Lai Yen	2520	93	3.7
5.	Van Canh	2134	79	3.70
6.	Đuc Thuong	2679	99	3.7
7.	Kim Chung	2843	125	4.38
8.	Di Trach	2072	118	5.72
9.	Yen So	2503	18	0.7
10.	Đac So	1120	26	2.3
11.	Minh Khai	1364	14	1
12.	Dương Lieu	3094	137	4.42
13.	Cat Que	3228	161	5
14.	Tien Yen	1520	94	6.2
15.	Song Phuong	3174	286	9
16.	Van Con	3107	189	6.09
17.	An Thuong	3612	100	2.77
Thach That district				
18.	Huu Bang	3403	143	4.2
19.	Phung Xa	2733	123	4.5
20.	Thach Xa	1670	88	5.28
21.	Binh Phu	2140	128	6
22.	Kim Quan	1972	191	9.70
23.	Chang Son	2145	58	2.69
24.	Huong Ngai	1959	115	5.86
25.	Canh Nau	2717	67	2.47
26.	Di Nau	1600	222	13.9
27.	Can Kiem	2079	123	5.9
Quoc Oai district				
28.	Quoc Oai	3299	274	8.31
29.	Ngoc Liep	2070	174	8.4
30.	Ngoc My	3024	293	9.7
31.	Đong Quang	3542	283	8
32.	Thach Than	1678	34	2
33.	Nghia Huong	1842	136	7.39
34.	Liep Tuyet	1469	217	14.8
35.	Yen Son	1972	256	13
36.	Phuong Cach	1366	114	8.38
37.	Can Huu	2.131	213	10
38.	Sai Son	4.980	181	3.64
Total		**91,233**	**5,168**	

121. Quoc Oai district currently has 21/21 communes/towns meeting the national standard in healthcare. The district implemented the extension of the project; upgrading the district hospital with capital of VND 205 billion; leading the propaganda of population ordinance limiting to give the third birth. Rate of birth is 17.6/1000 inhabitants, decreasing by 1.2% compared with planned. In 2011, the district had 412 third births, accounting for 13.6/1000 inhabitants, decreasing by 0.2% compared with 2010. The district healthcare system was always consolidated and developed in both public and private sectors. Up to now, 100% communes/towns in the district has doctors, reaching 4 doctors per 10,000 residents; all

hamlets/villages has some medical personel and all communes meet the national standard in healthcare. Proportion of malnutrition among childrens under five year-old decreased to 12.9%. The infrastructure of the district have seen investments for repairs, upgrades and new buildings. Almost all clinic centres were relatively built and equipped according to the list of regulations of Ministry of Health. The food hygiene program has always paid attention and reached a high efficiency. Finally, the whole district had currently 85% of cultural HHs, 62 cultural villages out of 93 villages, 13 schools meeting the national standard, etc…

122. Thach That district currently has 23 clinic centres with total personel of 154 doctors and nurses, of which 23 doctors had served at the commune clinic centres. Thach That has 16 communes reaching the national standard in healthcare. Thach That is well-known with many vocational villages including capentry sector of Chang Son, sector of textile of Huu Bang, sector of weaving and knitting of Binh Phu, sector of metal manufacturing and processing of Phung Xa, sector of sweetened porridge of Thach Xa and sector of candy of Dai Dong. At present, some regions in Thach That district including Chang Son village, Phu Hoa hamlet (Ra village) in Binh Phu commune and Thach Xa village still kept the traditional arts sectors of Water Puppet. Thach That district also has some pagodas indulding Di Nau pagoda, Kim Quan pagoda, Huu Bang pagoda and Tay Phuong pagoda in Thach Xa commune.

123. Hoai Duc district currently has a strong capacity in healthcare, education and culture. The district has completed the plan of school year 2011- 2012, focused on the investment in building the schools meeting the national standard, etc… In 2012, the district had 12 schools meeting the national standard.

M. Religious and cultural significant sites

124. Due to the extent of the project, many old villages with religious works proximal to the construction site will be encountered. The sites that have been reported are the pagodas Ngoc Manh, Huong Do, Hau Ai, Di Nau, Kim Quan, Huu Bang, Tay Phuong, Thay, Vuc and Muc Dong. Along the construction site, the Lai Yen cemetery and the Van Dien cemetery park will also be in close proximity with the operations. Nonetheless, all precuationay measure and safety procedure to prevent any damages have been planified.

125. Since the construction takes place in well established communities that have a long historical past, it is possible, considering the excavation to be done that cultural chances finds be detected. In the event of such occurance, special procedure for a specific assessment of these find will be put in place.

N. UXO Risks

126. UXO: More than 35 years after the war ended, Vietnam is still contaminated with hundreds of thousands of tons of UXOs (unexploded ordnances) scattered all over the country in urban and rural areas. This is the case in the west area of Hanoi. During earth work and especially for the pipeline excavation corridor, survey for unexploded ordnance prior to construction work has to be conducted by a specialized agency.

O. Assessing the living standard level of surveyed HHs

127. According to the survey of monthly comsumption and income through questionnaires and surveyors observation of properties, the classification of HHs has changed more or less. The number of low and medium income HHs decreased while the number of rich and above-average income HHs increased (see in the following Table).

Table 21 HHs living standard levels

No.	HHs incomes community	Classified by HHs		Classified by surveyors	
		Number	Rate (%)	Number	Rate (%)
1	Low	75	7.,4	59	5.8
2	Medium	560	55.2	479	47.2
3	Above-average	342	33.7	395	38,9
4	Rich	38	3.7	82	8.1
	Total	1015	100.0	1015	100.0

P. Current situation of HHs' water supply source and consumption rates

128. In the area, 24.1% of surveyed HHS used only one water resource, 66.4% of HHs used two water resources and the balance used 3 or more water resources. Almost all HHs in the surveyed areas used water for all hygene purposes (food and cleaning) from mainly rain water and drilled well water.

129. The construction sites have two administrative institutions with water plants. One is located in Huu Bang commune, Thach That district and the other in Quoc Oai town, Quoc Oai district.

- Huu Bang commune: Currently, Huu Bang commune has awater plant built in 1994 for the local residentis where the proportion of of HHs using water from the plant reached 85%. Each household use in average 12 to 15 m^3/month with unit price of VND 6000/m^3. In general, the local residents are satisfied with the existing water supply service.
- Quoc Oai town: Proportion of HHs' aquaduct water consumption reached 57%. According to the overall assessment made with the local residents, the quality of running water is not good, so a majority of HHs used the aquaduct provided water for washing, and rain water for drinking and cooking.

130. According to the survey results:

- 146 HHs being surveyed using running water were in Quoc Oai town, of which only 141 HHs had connected the running water supply system, 3 HHs used running water for cooking and drinking purposes.
- 77 HHs without water supply system are including: 8 HHs in urban HHs in Tram Troi town (accounting for 5.3%), 1 household in Son Dong commune (accounting for 0.5%), and 68 HHs in Thach Xa commune (accounting for 45.9%). These HHs have to buy water for essential purposes of cooking, drinking and washing. The main reasons why the local residents do not use running water are because of the quality and quantity of it not meeting the demand, especially in Thach Xa commune. Thach Xa residents use water from two main sources: deep well water accounting for 70% and drilled well water accounting for 30%, but from October to March in year it is dry season, situation of water shortage usually occur. So, HHs have to buy and economize water.
- Only two HHs use untreated water from river, lakes and ponds for washing purposes.

Table 22 Statistical figures of water sources used for HHs' purposes

No.	Water source	For cooking		For drinking		Bathing		Washing	
		Number	Rate (%)	Number	Rate (%)	Number	Rate (%)	Number	Rate (%)
1	Running water	3	0.3	3	0.3	145	13.2	145	13.2
2	Deep well water	0	0.0	0	0.0	81	7.4	81	7.4
3	Drilled well water	242	23.0	229	22.1	854	78.0	857	77.9
4	Rain water	729	69.4	728	70.3	13	1.2	14	1.3
5	Water of rivers, ponds and lakes	0	0.0	0	0.0	2	0.2	2	0.2
6	Bought water	77	7.3	75	7.2	0	0.0	1	0.1
	Total	**1051**	**100.0**	**1035**	**100.0**	**1095**	**100.0**	**1100**	**100.0**

a. Water of ponds, lakes:

131. Thach Xa commune had one household using the pond/lake water; water-taking distance is over 50 m; this untreated water source was filtered through sand and pebble before using. The depth is 5 m in dry season and 7 m in rainy season. One low-income household located les than 10 m also from that pond use this water with distance of under 10 m. This situation shows that those HHs paid no attention to the hygiene safety; awareness about using clean water was not paid attention, mainly according to their habits and convinience. Besides, some HHs are having difficulties in accessing water sources including unhygienic water sources.

b. Running water:

132. Of 223 HHs using running water for living purposes, only 141 HHs in Quoc Oai town had running water system connected at their houses. The running water connection processes has been implanted in 2010 at a cost of VND 1'516'000 per HHs.

133. Water supplying hours in average s 6 hours in a day, according to HHs' opinion, water supply volume was sufficient for daily demands; only 2 rich/above-average HHs said that that volume had not been sufficient.

134. Each household consumes 24.4 m^3/month of water in average; and the monthly fee for water was VND 106'000 per month.

Q. Situation of hygiene, environment and diseases related to waste water disposal

a. In terms of latrine of HHs:

135. In the surveyed area, 989 HHs had latrines (accounting for 97.4%). Of thoses 989 HHs with latrine, 96.1% of HHs had a septic tank. Among the surveyed HHs, 87.0% of low income HHs, 96.2% of medium income HHs and 98.3% of rich HHs were using septic tanks. In the area, there are some HHs using two-compartment latrine for agricultural purposes, the poor and medium HHs usually use one-compartment latrine or dug latrine.

b. Situation of solid wastes managment:

136. Of the surveyed local residents, 80.5 %said that the surveyed areas has a daily waste collection sytem and 14.6% of them are taking their wastes to the public dumping ground. However, the remaining 2.5% has treated their wastes by burying or burning them in their gardens, and 2.5% of HHs had the habit of throwing their wastes on the fields or in rivers or ponds. These numbers are not so high, but they create a not so negligeable impacts to the environments hygiene of the local HHs in particular and of the community in general.

c. Situation of waste water drainage system:

137. In general, the brick and concrete drainage system was covered 100% in the construction sites, 78.4% of surveyed local residents opinion said that all local areas has a water drainage system built of brick or concrete and 95.4% of HHs had connected their waste drainage system to the hamlet waste drainage system. Only 4.6% of HHs had discharged their water waste directly into ponds, lakes, rivers or cannals.

138. The current wastewater installations projects seem to be on their way and the only existing one has been proven ineffective and overloaded. Those installations are:

Table 233 Wastewater treatment expected to construct in project area

No	Relevant base	Location	Time	Funding
1.	Green Sun Wastewater treatment plant	Duong Lieu-Hoai Duc	It is operating, however, it has been overloaded and ineffective. No information of construction and completion time	By Green Sun Company's investment
2.	Wastewater treatment plant at Duong Lieu commune	Duong Lieu-Hoai Duc	2014-2016 (expected)	Socialization
3.	Wastewater treatment station at Lai Yen commune	Lai Yen-Hoai Duc	2016-2020 (according to plan)	Socialization
4.	Wastewater treatment station at Lai Yen commune	Lai Yen-Hoai Duc	2016-2020 (according to plan)	Socialization
5.	Wastewater treatment plant at Son Dong commune	Son Dong – Hoai Duc	2014-2016	Budget
6.	Wastewater treatment plant at Van Canh commune	Van Canh – Hoai Duc	2014-2016	Budget

V. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Area of influence of the Project

137. The area of influence of the project includes the BPS area and the area served by the new pipe network a sindicated in the table below.

Table 24 Area of Influence of the Project

Zone	Locations
BPS	Son Dong commune (Som Tay town)
Area served by the new pipe network	
Zone 1: North Lang-Hoa Lac road, from road No.70 to Day river, limited by road No.32	Hoai Duc district, including communes: Di Trach, Kim Chung, Duc Thuong, Duc Giang, Cat Que, Duong Lieu, Minh Khai, Song Phuong, Yen So, Dac So, Tien Yen, Son Dong, Van Canh, Lai Yen (14 communes) and Tram Troi town.
Zone 2: South Lang-Hoa Lac road, from the intersection point between road No.70 and Highway No.1A, following road No.70 to Provincial Highway No.72 and South direction of Hoai Duc people's committee to Day river	Hoai Duc District: Van Con and An Thuong communes
Zone 3: North Lang-Hoa Lac road from Day river to Tich River, limited by road No.420	Thach That district, including communes: Huu Bang, Phung Xa, Thach Xa, Binh Phu, Kim Quan, Chang Son, Huong Ngai, Canh Nau, Di Nau,Can Kiem (10 communes). Quoc Oai district: Yen Son and Sai Son communes
Zone 4: South Lang-Hoa Lac road from Day river to Tich River, limited by Can Huu and Dong Quang communes	Quoc Oai district, including communes: Ngoc Liep, Ngoc My, Dong Quang, Thach Than, Nghia Huong, Liep Tuyet, Phuong Cach, Can Huu (8 communes)

B. Design and Location Consideration

138. Location of the BPS has been chosen due to its low impacts on human activities (0.5 ha of agriculture land) and the absence of structures.

139. Location and elevation of the BPS was selected based on hydrologic data, flood data in the past 20 years to ensure that it's not affected by climate change and natural disasters in the future.

140. Climate change impacts will be further considered during detailed design. If necessary, proposed adaptation measures will be identified and included in the detailed design (i.e.

increase of road elevation, increase of drainage pipe diameter to accommodate more extreme flooding; etc.).

C. Impacts assessment

141. Project of Investment and Development of Water supply system along Lang Hoa Lac Road (Within Hanoi City limits) transferring treated water from Da River WTP will have the positive impacts to the local socio-economic development in the west area of Hanoi city in general and three districts of Hoai Duc, Quoc Oai and Thach That in particular, improving significantly the local resident living environment and condition, ensuring the local resident health and potentially attracting investments in these areas.

142. After finishing the project, the environmental protection, not only the water environment but also the air and soil environment, will be favorized, because the clean water is an important preliminary factor to assure environmental protection in general. creating clean areas with high attraction, for example entertainment areas, amusement parks, resorts, etc... generally depends very much on proper hygiene services such as a clean water resource. So, this water supply project will be an important preliminary factor, paving the way for the urban environment project..

143. The local residents living conditions will be improved by to this clean water supply project and water born illenesses due to unsnitay water will be reduce to a minimum. According to the statistical figures, water bord illnesses currently still account at a high rates in the common diseases so there is a high chance that the project will help to redecue the costfor the public healthcare interventions.

144. This project will create more jobs for laborers in the process of implementing the project, suplementing the human resource and create a stable number of jobs for employees directly managing or operating the water supply system.

Table 25 Main types of environmental impacts of the project

Investment items	Main types of the environmental impacts	
	In construction process	**In operation process**
At site of building the pressure boost pumping station		
Air environment	Dust due to transport and construction. Noise and vibration generated from the transport and construction vehicles, machines and tools in the process of excavation, digging or banking. Exhaust gases from the transport and construction vehicles. Dust from improperly manage spoils.	Noise, vibration from engines of pumps when operating. Gas of active sodium hypochlorite from containers or sodium hypochlorite (NaClO)storage building .
Water and soil environment	Impacts from the workers wastewaters at the worksite	Waste waters from workers operating the pump station: not much, due to small scale.
Flood, landslide, soil erosion due to heavy rain	Flood, mudslide due to heavy rain at site. Improper drainage around heaps of soils and	Unlikely since all locations are relatively flat..

Investment items	Main types of the environmental impacts	
	In construction process	**In operation process**
	non coverage of temporary stored spoils.	
Solid wastes	Waste land, rock, debris. Solid waste from workers. Unmanaged leftover spoils.	Waste from workers operating the pumping station: not much.
Potential risks	Accidents due to UXOs. Traffic accidents. Labor accidents. Impacts to the commuting local residents. Road damage.	Incidents when operating the BPS: electricity cutting off, , leaking chemicals (sodium hypochlorite (NaClO)used in the sterilization. Incidents in pressure at the BPS might deform the pipes. Labor accidents.
Social impact	Impacts to the local residents and farmlands and crops. Conflics between workers and local residents.	Supplying clean water to the local residents with all the psychological benefit of not woring for the safety of the water source.
At site of building the water pipeline sections		
Air environment	Dust from the processes of digging, excavating trenches, transporting the construction materials and wastes. Noise, vibration from pipeline installation. Trucks and machinery emissions at work site.	No impact.
Water environment	Digging or excavating trenches might break the underground drainage pipes, causing pollution. Spoils and wastes from the excavation might drop into the nearby water areas if the site is not shielded or covered. Heavy rains in the construction process might dilute soil, wastes into the nearby water environment. The wastewater that will stillcontains active chlorine after washing the pipelines (washing the pipelines before putting into operation).	Water leakage fromjoints, connecting points and discharging valves on pipelines. Incidents when breaking or damaging pipelines. Periodic clean up of the supply pipelines accumulated sediments and deposit. .
Soil environment	Soil from digging, excavation.Unplanned spoils and excavated material dumped site.	When occuring incidents that require to repair the pipelines, it will be necessary to excavate.
Solid wastes	Soil from digging, excavation; construction wastes. Solid living waste of workers working at site.	None.
Social impact	Conflics between workers and local residents.	Completing the infrastructure. Creating jobs for local workers. Raising awareness on promoting, the pipelines and the use of an hygienic water resource.
Impacts to the traffic	Impact on the traffic along roads where the pipeline will be installed or useto transport	Not impact in general, apart from pipeline breaking incidents that

Investment items	Main types of the environmental impacts	
	In construction process	**In operation process**
	the construction supplies and equipment.	need to excavate.
Potential risks	Labor accidents. Traffic accidents.	Landslide, mudslide or pipeline emerging due to heavy rain, causing breakeage or damages to the water supply pipelines.

A. Environmental impacts during project's preparation

a. Impacts to the social environment

145. Experience shows that land compensation and ground clearance are always complexe. In order to solve the land compensation and the ground clearance procedures, there should be cooperation with local authorities and relevant agencies. The process of land assesment and compensation should be optimize so the land recovery and compensation be done as quick as possible to avoid any project draw back. All decision for reasonable compensation level according to each subject need to comply with the regulations of Vietnam's Land Law in force.

146. Under this project, land compensation will be implemented only for the BPS area inSon Tay since the pipelins areas are all located on public land along the road side.If roads do not have the roadside or the roadsides are to narrow, the pipelines will be installed in the roadbed, limiting the impacts to the existing legal works. However, it is still necessary to implement a survey to identifythe existing works, trees and barriers blocking the the construction of pipelines, that needs to be cleared away and compensated.

147. According to design, the area to build Son Tay BPS was estimated to revoke endlessly 5000 m² of farmlandand the relocationof some graves. Statistical figures on impact level show that 15 HHs will beimpacted due to the construction This project will not impact any religious works (pagodas, temples, shrines) of the local residents or any classified historical monuments. Compensation methods for the impacted residents will be introduced in another detail report of the project. Besides, in the ground clearance process, it will be necessary to pay attention to the potential risks of UXOs. Even though this posibility is very low in the project areas, the contractor will be responsible for safety at site. The proper military agency will be hiredto detect the UXOs in the ground clearance process and manage them if any are found.

b. Impacts to the natural environment (soil, water and air environment)

148. The management of the rubbles from the access to the BPS location in Son Tay town will be the main issue in waste management. The ground clearance process must remove fences, walls and some works of the local residents in order to open apath for the construction vehicles and machines coming in and out. The demolition process will generate dust and noise partly, temporarily impacting the nearby HHs. The solid wastes generated from the activities of removing the construction works and activities of organic matter removal (grasses, trees) in the area of the BPS, if not collected and discharged suitably, will impact the living environments and landscape of the nearby residential areas. Besides, the construction machines and the solid waste transport vehicles will also cause some problems including exhaust fumes of engines, dropped wastes or materials, noise, vibration, dust, etc...

c. Environmental impacts during project's construction

a. Environmental impacts when building the BPS

Impacts to the air environment

149. Main impacts to the environment in the construction process mainly generate from activities of leveling the ground and transporting materials on site are:

- Dust generated from activities of leveling, bulldozing, rolling, excavating, banking the spoils, transporting and gathering the constrcution materials;
- Dust generated from transport vehicles;
- Dust generated from improper management of loose material such as cement, soil, sand, stone, etc...
- Exhaust fumes from transport vehicles and construction machines containing harmful gases including SO_2, CO_2, CO, NO_2 and unburnt hydrocarbon (HC);
- Noise and vibration from activities of construction and transport..

150. These pollution causing factors will impact directly to the on site workers therefore they should be properly equipped wilt the necessary protective equipment to reduce any impact on ther healt.negative Also, the line of houses facing the National Highway No. 21A (about 10 houses) whose back walls are very near the construction site, especially two houses that have their the walls/fences near both sides of the entrance to the site, will be impacted significantly duraing the construction stage.

151. Transporting the construction materials, pipelines, equipment, solid wastes and construction wastes will use the National Highway No. 21. These transportations will generate dust, exhaust fumes/gases and noise, impacting to the local residents living along this road. According to the survey at the site and along this transport route, there are a lot of residence. However, because of low population density, the number oftransport vehicles, and the width of the road, it can be anticipated that exhaustfumes/gases and dust generated from the transport activities will generate a low level impact the local resident.

152. Sound pollution level are prodicted as following:

Sound spreading is calculated in formula:

L_{eq} = E.L + 10log(U.F) – 20 log(D/D_1) – 10 G log(D/D1)

Of which: Leq: sound level at the distance of D

E.L: sound level at the measured location (D1 m from the polluting source)

G: Geographical coefficient

D: distance needed to calculate

D1: distance from the source point

U.F: efficiency coefficient of engine

153. Because almost all engines will be used at the maximum capacity, the efficiency coefficient of engine U.F = 1, and in this case of construction, supposed that there is no barrier, the geographical coefficient G = 0, then, the sound spreading will be calculated in the following formula:

$$L_{eq} = E.L - 20 \log (D/D_1)$$

Table 26 Levels of sound pollution due to the construction and transport vehicles (source: * US Federal Transit Admistration (FTA). Transit Noise and Vibration Impact Assessment, 2006).

No.	Machines, equipment	Noise at distance of 15.24 m	Noise spreading (dB)					
			50 m	80 m	100 m	120 m	150 m	200 m
1	Cranes	88	77.68	73.60	71.65	70.08	68.14	65.64
2	Bulldozers	85	74.68	70.60	68.66	67.08	65.14	62.64
3	Bascules	85	74.68	70.60	68.66	67.08	65.14	62.64
4	Pile drivers	98	87.68	83.60	81.66	80.08	78.14	75.64
5	Soil pulverizer	83	72.68	68.59	66.66	65.08	63.14	60.64
6	Compactors, rollers	74	63.68	59.59	57.66	56.08	54.14	51.64
7	Trucks	88	77.68	73.60	71.65	70.08	68.14	65.64
8	Cutter/cutting machines	93	82.68	78.60	76.66	75.08	73.14	70.64
QCVN 26:2010/BTNMT								
6h - 21h		70	70	70	70	70	70	70
21h - 6h		55	55	55	55	55	55	55

154. According to calculation, using trucks to transport materials will generate noise beyon the permitted levels under the regulations of National Standard QCVN 26:2010/BTNMT. Especially, according to the permitted noise level in the residential areas from 21.00 to 6.00, using the construction machines during this time period almost generate beyond the permitted level of regulations of the National Standard in radius of 200 m. So, in the construction process, the contractor should limit duration of night time construction.

155. As we can see in the table above, the workers on site will withstand all kinds of sound with high intensity. As calculated, in a radius of 15 m, sound intensities will be over 85 db. This is the threshold that will make people tired when being in contact continuously with. If the sound intensity is higher than 90 db, hearing will be impacted. So, the workers at site should avoid close proximity for extended periods with sound source with high intensity, limit idle mode on the machines at site and use protective earing equipment.

156. According to technical report, some areas of the BPS will be excavated 1.5 m under the actual ground level. The volume of soil excavated for the trenches, the foundation of the buildings and the reservoir will be about 1696 m^3 with a soil density of about 1.4 ton/m^3. whole volume of soil will be transported by trucks. This means that volume of excavated and transported soil would be about 2374.4 tons. Excavated soil will be clean soil so it can be use to level sunken ground in the area if necessary. This could help reduce the cost of transport, pollution and potential risks associated with traffic. If we suppose that, the location to dump the waste is located in a 5 km radius from the site, according to the technical document, in the radius of 10 km (coming to then back), each truck consumes about 0.0025-0.003 ton of gas. So, the volume of consumed gas will be about 0.47 ton.

157. At present, Vietnam does not have standards on source dischargment pollutants from vehicles, so we based the calcul on World Health Organization (WHO) standards on using the method to determine quickly polluting source in “pollution coefficient of the air” in order to calculate the volume of gas wastes generated from vehicles in the material and waste transportation.

Table 27 Volumes of gas wastes discharge

Pollutants	Pollution coefficient (kg of gas emission)/ton of consumed oil)	Volume of contaminants discharged (kg)
Dust	4.3	2.02
SO_2	20S	9.4
NOx	55	25.85
CO	28	13.16
VOC	12	5.64

S: rate % of sulphur in fuel (accounting for about 0.2-0.4 % in oil and gasoline)

158. In general, the volume of emissionslow in total duration of construction and will be majorly discharged as in the table above during the BPS ground leveling phase.

Impacts to the surface water environment – Possibility of flood at site during heavy rains

159. The environmental impacts due to the leakage of soil, rock, debris, wastes, water wastes into the nearby fields of the local residents when raining must be taken into account. Banks when excavating, banking and building the water reservoir must be reinforced in order to avoid sliding when heavily raining. It will be necessary to design temporary drainage measures on site in order to lead rainwater into the general drainage network. Besides, spare pumps must be prepared in case of a flood during construction.

Solid wastes and harmful wastes

160. The process of building the BPS will generate construction wastes such as sand, macadam, cement and debris. This volume of wastes, if not managed properly, will be a source of pollution. To save the cost and limit environmental pollution due to transportation, the clean wastes should be used to level the nearby sunken ground if necessary. The debris containing foreign material such as plastics and petrol base products such as asphalt and macadam should be properly dispose.

161. Wastewater from workers at BPS site might pollute the surface water environment. The volume of solid and wastewater depend on the number of workers at site. However, for this project, almost all workers will be seasonal workers living in the vinnicity of the project., These workers will go back home after each working day, therefore impacts from the workers waste waters will not be much and this polluting source will be completely discarded by setting up mobile latrines and proper daily waste managment..

162. Harmful wastes at site will mainly be wasted lubricant or leaked oil. This volume of wastes should be managed suitably in order to avoid the situation of spilling or dumping wastes on to the local residents nearby farm land by workers.

Impacts to the social environment in the areas around the site of BPS

a. <u>Labor and traffic safety in the construction process</u>

163. It will be necessary to pay attention in preventing and avoiding traffic accidents during the transport of the construction materials and wastes on the National Highway No. 21A. For the activities of using trucks to transport in/out the site, it will be necessary to arrange flagmen services, set up work warning signs, speed limit signs, install the light system when working at night.

164. The transport process might increase the risks of damaging roads and the local resident's infrastructure like walls and fences. In that case, contractor will be required to reach an agreement in compensation and repairement of these damaged works with the local residents.

165. Also, the BPS has two water 3000 m^3reservoirs. During their construction, the excavated site will need proper fencing to avoid any falls in the pit.

166. Finally, the concentration of a large number of workers at site will increase the risk of an epidemic diseases break out.

b. Environmental impacts when building the clean water transmission and distribution pipelines

167. This project will lay about 81,515 m of clean water transmission pipelines and distribution pipes which have diameters ranging from 400 mm to 1200 mm, and the service pipes, which have diameters between DN 50 to DN 300, to the local HHs in three districts.

168. For the distribution pipelines to the villages and communes in three districts, due to small diameter of pipeline, the volume of excavated soil at a certain location at a certain time will not be significant, leading to a low environmental pollution potential.

169. Concerning the traffic, all pipelines will be installed along the roads/paths in the villages and communes, which have a low traffic density so the traffic impacts will not be significant. Therefore, we will only focus on assessment of impacts to the local environment and society impacted by building the clean water pipelines with large diameter that will be installed along main roads, especially the Provincial Road No. 70 with pipeline diameter of DN 1200 mm – 500 mm - 400mm and DN 800 mm.

Impacts to the air environment

170. Sources of of air pollution such as dust, exhaust fumes/gas wates, noise/sound and vibration will be created by the activities of transport and movement of construction materials such as cast-iron and PVC pipes, leftover excavated soil, sand, stone and macadam and activities of building, excavating, installing the pipelines. Because almost all of the clean water transmission pipelines will run along existing main road (except that Section 6 runs along boundering road 4), the air impact will be limited in time and space.

171. Nonetheless, some of them will have sensitive areas to cross such asresidential areas, school, temple or pagoda(see in Table of current situation of the construction sites). The section of pipeline that has the most sensitive points is section of pipeline running along the provincial road No. 70 from Van Dien to Thang Long Avenue to Nhon (Section1). This section uses the largest diameter DN1200 mm and DN800, in the last section of pipeline connecting to the end of Van Dien. The section of pipelines with a diameter of DN1200 will be installed in narrow roadbed with some sections having a width of only 5 m. Many sections have residence on both sides and especially sections run through Ngoc Mach, Tay Mo, Dai Mo, Road Phung Hung – Ha Dong. Also, this section will run nearby major hospitals such as Military Hospital 103, Second Branch of K Hospital, National Hospital of Burn, and some public parks like Nguyen Trai Statue Garden, Van Dien cemetery Park, and schools for instance Hanoi Industrial Technical College, Phan Trong Tue Vocational Training Secondary School.

172. Also, section of pipeline with diameter of DN600 mm running along Van Canh Road (the Provincial Road 22) (Section 3 according to the table above) will be in widersection of road. But, this section runs through crowded residential areas including Ngoc Mach, Hau Ai (Van Canh),

Son Dong, and shools including Van Canh Secondary School. When building in those areas, especially schools, it will be necessary to arrange asuitable schedule for building in order to avoid rush-hours to limit the impacts on the air environment and noise pollution to pupils and students.

173. For other sections of pipelines (Section 2 and Sections from 4 to 12)n which will be DN 400 mm or DN 500 mm, in general, all of them will run along wide roads for example the National Highway No. 21, the Provincial Road 80, the National Highway No. 32 from Nhon to Duc Thuong, installing and laying them will not impact to the environment significantly.

174. For sections of pipelines running near residentials areas houses, schools, hospitals and public parks, exhaust gases, and noise from transport trucks and excavators will sporadically pollute the environment and might impact to the local residents health, especially to the peopleliving and working in the corridor of 200m along the axis of the road where the pipes will be installed. However, because the process of building will be implemented section by section and the number of machines will be reduce to a minimum ,the impacts to the air environment will be low and isolated.

Impact levels

175. According to the preliminary estimation, the total volume of the excavated soil of total trenches will be 318'356 m^3. The volume of soil and sand (mainly sand) using to level the ground after completing the installation of pipelines will be 242'244m^3. the volume of sand will be transported from available sources. At an average density of sand of 1.2 ton/m^3, and using 15-ton trucks, the number of transports will be around 19 380. Since each truck will travael about 20 km back an forth to transport sand, the volume of comsumed gasoline will be around 19'380 x 2 x 0.003 = 116,28 ton. The volume of the leftover excavated soil is estimated to be about 318'356 m^3, which will need about 29 713 transports using 15-ton trucks considering that the average density of soil is 1.4 ton/ m^3. To reduce costs and limit the pollution and the potential risks of traffic accidents due to the transport activities, this volume of the leftover excavated soil should be better used to level nearby sunken areas, if any such spaces are available. If adding up the consumed oil to transport the sand for banking and the consumed oil to transport the leftover excavated soil, the volume of gas wastes in the process of building the transmission pipelines will be estimated as following:

Table 28 Volume of gase wastes discharged when building the pipelines

Pollutants/gases	Pollution coefficient (kg of gas emission/ton of consumed oil)	Volume of contaminants discharged (kg)
Dust	4.3	831
SO_2	20S	3 863
NOx	55	10 623
CO	28	5 408
VOC	12	2 318

S: rate % of sulphur in fuel (accounting for about 0.2-0.4 % in oil and gasoline)

Impacts to the traffic

176. Transportation of the various materials and work sites will be the major source of disruption along the deployment grid. Excavating trenches Sections of roads, where will be installed the clean water transmission pipelines will be impacted especially the section of the Provincial Road No. 70, where will be installed the diameter of DN1200 mm pipeline. This

section is the narrowest road section running through many crowded residential areas including Ngoc Manh, Tay Mo, Dai Mo, crossing the railway (1.5 km from Thang Long Avenue to Nhon), running through streets with line of nacre trees on both sides (abour 2.5 km from Thang Long Avenue to Nhon). According to estimation, the section of diameter of DN1200 mm pipeline will need around 5'632 shipment of 15-ton trucks to transport the leftover soil and 3'698 transport of sand to level the ground. This will significantly impact the traffic, especially in the narrow road sections. For the section crossing the railway, it will be necessary to pay attention to the timetable of trains in order to avoid traffic jam locally due to railway barriers. For the section of pipeline running along the line of nacre trees, it will be necessary to avoid breaking roots of the trees, leading to falling trees, traffic jam and traffic accidents. Note htat only one quarter of the tree root can be remove in order to keep its stability and to have a chance of survival. This pipeline section also crosses two important roads with high traffic density, the National Highway No. 32 and Thang Long Avenue, so, the process of building pipeline along the Provincial Road No. 70 must be arranged suitably in terms of timetable and the volume of building in order to avoid impacting the traffic at these two important locations.

177. Also, trenchestrenches, for installing pipelines, running near the residence, especially in the residential areas, must be at a safe distance from house walls, walls and fences, or must have a measure to reinforce the basement suitably in order to ensure soundness of the infrastructure. For the section of pipeline installed along the Provincial Road 422, planned road connecting West Lake to Ba Vi later, it will be necessary to pay attention to the depth and location of installing pipeline in case of building extension foreseen in planning documents.

Impacts to the water environment

178. The process of building the water transmission pipelines needs to excavateexcavate at depth of 1.5 m – 2.0 m trenches, depending on the diameter of pipelines. This exvacation process might have the potential risks of breaking the existing drainage system, leading to water environment pollution. For the transmission pipeline installed along the National Highway No. 32 fron Nhon to Tram Troi to Duc Thuong, this section of pipeline running along a newly-built road, through many new urban areas and residential areas like Kim Chung, Di Trach and Lideco, will have a high potential risks of encounteringand breaking existing facilities including water waste drainage, electric and communication networks. Similar to this is the section of pipeline installed along the Provincial Road No. 70. This section is estimated to encounter many underground works in the crowded residential areas, especially section running through Ha Dong district crossing the extended Le Van Luong Road, Nguyen Trai Road and Phung Hung Road. For remaining sections of the transmission pipelines running out of towns and crowded residential areas, the potential risks of digging through underground works will be low.

179. There are 27 small bridges crossing rivers, canals and irrigation ditchs (for further detail, see in table of current situation of the environment in the proposed areas of the project). When building section of the transmission pipelines that will be held against the bridges structure, it will be necessary to pay attention to the measures necessary to limit soil spillage into nearby water and sspecially during heavy rain event that will lead to soil erosion at site. These spills could block the stream, impacting the quality of water. If the construction calendar is set in the dry season when precipitations are at their lowest, the impacts will be limited to the surface water environment.

180. After completing the installation of the clean water transmission pipelines, it will be necessary to sanitize the pipelines with a solution of chlorine at a concentration of 40 - 50 mg/l.

after the processes, the concentration of active chlorine in solution will decrease to 0.4-0.5 mg/l although it could be higher in some cases. This volume of water with residual chlorine will be discharge into the environment. According to the estimation, the process of washing 102.01 km pipeline with diameter of DN400 mm - DN1200 mm will discharge around 50'000 m³ water containing active chlorine. This volume of water might damage the surface of roads and works, and demolish the living environment of water lives if discharged into ponds/lakes. Since the grid won't throw out all the water in one place and that the drainage will be done with deviation devices to prevent infrastructure liquefaction, impacts to the environment should be minimal. Note that the best time for this type or operation would be during a precipitation event or the rain season.

Domestic solid waste, construction wastes and harmful wastes

181. The volume of solid waste from workers working at site will not be significant because the process of building will be implanted section by section. The number of workers installing pipelines at site at a certain time will not be above 100.The volume of living waste will estimatedly be less than 50 kg per day since in average, each worker discharges 0.5 kg waste per day. However, the area and the duration to build and install the pipelines will be so large and long respectively, it will be necessary to collect and gather regularly the wastes from the workers at site.

182. The process of building and installing the pipelines will mainly be activities of excavating and banking soil. However, some sections of long pipelines will require the excavation of the asphalt layer of road or concrete layer of pavement in sections running near HHs. These sections, after completing the installation of pipelines, must be refit with pavement or asphalt according to the original situation. For these sections, a certain volume of cement, sand, stone, macadam and asphalt will be used and of course a certain volume of the construction wastes will be also generated, so it will be necessary to discharge the materials suitably to avoid spreading into the surrounding environment.

183. Harmful wastes: Harmful wastes discharged in the process of building could be oil spill spill by hose or engine failure from the various machinery on site and off site. It will be necessary to replace lubricant oil and have a periodic maintainance for all vehicules at a proper maintenance facility.

Social order, public security and labor safety

184. Concentrating the labor force at site in the residential areas at some stages of the process of building will increase the potential risks of arising social order problems, public security, epidemic diseases, contradiction, conflict, disputes between workers and the local residents. This build being spread on a wide period of time and workers commuting back to their homes after work will reduce the risk of any social disturbance that could occur.Nonetheless, it will be necessary to implement aclose management of workers at site in order to avoid arising these problems.

185. In the process of building, gathering a lot of valuable equipment, tools and materials at site will increase the risks of theft, robberies or sabotage. So, it will be necessary to closely manage the site, the security guards must be trustworthy and there should be cooperation with local authorities and people in order to limit any potential risks of regrettable incidents/losses.

186. Traffic accidents occurring in the process of building might be by the following reasons:

- Not training site manager and workers about labor safety.

- Not providing adequate protective equipment, tools and clothes to workers.
- Workers not complying with labor safety measures.
- Site manager's lacking supervision in the process of building.
- Application of incorrect technical procedures.

187. In the process of building, contractor must pay attention to good implementation of the labor safety rules in order to limit the risks of accidents.

188. Attention must be observed to the non-workers around the excavation sites. Falls in excavation pits not well secured and moving machinery in the work area are the main concerns. There is also the management of spoils that could cause some problems if they are not properly managed. Dried up spoils surface could become airborne and be aspirated through breathing causing respiratory problems to people at risk such as infants and elderly people.

Impacts to religious works

189. The path to build the clean water transmission pipelines will run through the entrance of some pagodas (as see in table of current situation of the environment in the areas of the project). Some pagodas like Ngoc Manh pagoda, Huong Do pagoda (in section of the National Highway No. 70), Hau Ai pagoda (in section of the Provincial Road 442) have their entrance near the road. It will be necessary to ensure a safe distance when digging the trenches and take suitable measures to avoid depressing or breaking the religious works. Besides, the process of building might block or hinder the entrance to pagodas in days of religious services or the fifteen of the lunar months to Buddhists. So, it will be necessary to arrange a suitable timetable of working, avoiding days of buddhists travelling to pagodas when building at/in such sensitive areas. Temporary passages with proper railing could be layed over the trench if it is not possible to do otherwise.

d. Environmental impacts during the project's operation

a. <u>Environmental impacts when operating the BPS</u>

Impacts due to noise

190. When the BPS will be operated, noise might be emitted from the pumps. All pumper are electrical and were manufactured with modern technologies. They are design with anti-vibration systems to limit noise levels. However, the front side of the BPS is near HHs facing to the National Highway No. 21 therefore, it will be necessary to install pumps in the back area of the station to reduce the risk of disturbance. The pumps should be also installed in a close room in order to limit noise/sound pollution to the nearby.

Impacts due to solid and water wastes of workers operating the BPS

191. The number of workers, maximum of ten, operating the BPS will not be significant and these workers will work in the daytime. However the volume of living wastes from them will need to be collected and preliminarily treated before discharging into the general drainage network. The solid waste will be also need to be collected regularly. A local drainage network in the BPS must be also designed suitably to ensure that waste and rain waters do not pollute the clean water in the clean water tanks.

Incidents when operating the BPS

192. In the process of operating, there might be some incidents arising due to sudden increase/decrease in pressure, leading to damaging or breaking the pipelines. Also, during heavy rain events, soil depression might make the pipelines break or damage in areas around bridges. All incidents must be taken into account in the process of designing.

193. The clean water from the BPS, before supplying to the area of Son Tay town, will be sterilized with sodium hypochlorite (NaClO). The active chlorine that will be generated from NaClO has an aggressive smell and it is a harmful chemical to the environment and man's health when exposed to a certain dose. If leaked, the active chlorine gas will be a threat to any living organisms nearby.

194. Labor safety protocols for workers operating the BPS should be scrutinized. Proper training and equipement should eb made available in case of chlorine spill or fire or explosions events.

b. Environmental impacts when operating pipelines

195. The clean water in the transmission and distribution pipelines basically will not have impacts to the natural environment, except incidents of leaking at joints/connecting points or breaking or blocking the pipelines due to soil/land depression. If such incidents should occur, the clean water might overflow on the surface of roads, weeping with dirty matters for example lubricant oil wastes, wastes dropped from the traffic vehicles, etc…, polluting the nearby source of the surface water or absorbing into the ground, polluting the soil environment and the underground water source. Also, incidents of breaking or damaging the pipelines, especially the transmission pipelines with large diameter, might flood locally, leading to blocking/hindering the traffic . So, there must be a proper plan of action setup to insure immediate responsesto these incidents.

e. Impacts due to potential risks and incidents

196. The potential risks in the processes of building and operating will be as following:

- Land slide, depression: when building, contractor must excavate land to build water reservoirs/water tankers in Son Tay BPS and excavate trenches to install the clean water transmission pipelines. These activities might cause landslides or/and depression in the areas of building. Reasons for land slide or/and depression are: faulty stabilization of the edge of excavated pits; depressing the ground surrounding the excavated pits; and damaging the structures of the basement and underground components that had been built near the excavated pits or in the bottom of excavated pits.
- Labor accidents and traffic accidents: reasons for labor accidents and/or traffic accidents at site in the process of building could be : workers not complying with the regulation on labor safety; workers not being properly equipped ; workers not operating following the guidelines; drivers speeding along, bypassing carelessly, using stimulants when transporting construction materials and supplies, workers not being in good health condition; working beyond the capacity, leading to be dizzy and nodding off, etc… , should be avoided.
- Incidents of chemicals: in the process of exposing sodium hypochlorite (NaClO), workers might be poisoned due to the leakage of NaClO into the environment.

- Incidents of leaking, breaking the water supply pipelines: in the operation process of the project, phenomena of leaking and/or breaking the water supply pipelines might occur due to low quality of pipes, clashing, natural disasters, etc… Incidents of breaking the clean water transmission pipelines of Da River water supply system will cut water all over the areas that have been supplied by the project, causing the material and spiritual losses to water consumers of the project.

B. Measures to prevent and limit the project negative impacts to the environment

a. Measures to prevent and limit the project negative impacts to the environment during the project's preparation

a. Measures to limit the project negative impacts to the environment during the process of land compensation and clearance

197. Project "Investment and Development of Water supply system along Lang Hoa Lac Road (Within Hanoi City limits) transferring treated water from Da River WTP" with the capital borrowed from ADB will take back the area of some 5000 m^2 in order to build a BPS with tranfer capacity of 30 000 m^3/day. This area is owned by local farmers and will be revoked forever. The clean water transmission pipelines will be mainly built along with roads, so there is no need to revoke the land. Some sections of transmission pipelines will be built along with the planned roads. In the scope of this project, no household must be relocated and resettled, hence there is no need to make a ressetlement plan but only a compensation program.

198. In order to limit the negative impacts in the process of revoking land, compensating for crops and relocating some graves in the proposed areas to build the BPS and sections of clean water transmission pipelines along the planned roads, HAWACO must cooperate with the State management bodies in order to implement the program of compensating satisfactorily for land, crops, assets in the area of the project according to the existing regulations of the State and ADB as well as ensuring the legal right of the local residents who have loss the farmland, as following:

- HAWACO and consultant, after deciding on the location of the BPS as well as direction and location to install the clean water transmission pipelines or water distribution pipelines, must take the methods of the cheapest land compensation and clearance into account.
- Meet the local residents to inform them about the plan of building the BPS and the clean water transmission pipelines and the distribution pipelines; it will be necessary to regard them as the project serving the local residents.
- Survey the social and economic conditions in the construction sites.
- Determine the number of HHs whose assets, land, crops, graves, etc… will been impacted. Fully collect the legal documents, verify the area of land, crops, trees, real assets impacted of each HH.
- Make the plan of compensation according to the existing regulation of the State. The plan of compensation must be approved by the assessment council in Hanoi People's and agreed by the impacted HHs before compensation.

- People's Committee of districts and communes in the construction sites must announce publicly and inform the decision of approved plan of compensation to the local residents.
- On the ground of building the BPS, there are nine graves. Relocating these nine graves is a sensitive matter so it will be necessary to consider the spirituals issues in this part of the project. It will be necessary to plan carefully and reasonably to support and relocate these graves in order to avoid affecting the families.
- Financial source of the plan to compensate must be implemented timely and effectively from the design stage to planning and implementation of the project.

b. Inform the local residents in the construction sites

199. In the preparation process, HAWACO will inform the local residents and authrorities about the following matters:

- Objectives, significance of the project.
- Impacts to the quality of the environment, traffic, farming production activities due to the process of construction; measures to prevent and limit the impacts.
- Report measures to reduce the impacts; exchange opinions with the local residents about these measures; assess the feasibility and conformity with the local area.
- Enhance the community's participation in the environmental protection.
- Announce the information about clearing the ground and the plan to compesate for revoked/impacted land.
- Owner should inform the community through speakers, radio as well as meetings with the local cadres/leaders in the areas that the project will run through. Besides, HAWACO in cooperation with Consultant must survey and work directly with the local residents impacted or benefited from the project in order to know their interest, demand and expectation.

c. Unexploded ordnance (UXO) concerns

200. Since excavation related to infrastructure development is one of the main causes of accidental detonation of UXO in Vietnam, and given the proximity of the excavation work sites to populated areas, care must be taken to ensure that the pipeline route is surveyed for presence of UXO prior to construction. If such ordnance are detected and verified, clearing work will need to be commissioned, following established procedures under the National Mines Regulatory Authority, prior to undertaking any civil works. (A budget for this pre-construction survey work is provided in the environmental management plan.) It should be noted that areas required for the project have seen some development and modifications over the years. Road buildings, ditch excavation, construction have covered a lot of the project area. Nonetheless, UXO have been moved before without a deflagration and so being, although the risk is low, the whole excavation and building areas should be revisited by specialists.

b. Measures to prevent and limit negative environmental impacts of the project during construction

a. Measures to limit noise and vibration pollution

201. According to measuring figures, existing levels of noise in the construction sites are from 58.5 dBA to 71.8 dBA, fluctuating above the permited standard of National Standard

QCVN 26:2010/BTNMT on the noise/sound in the residential areas. In the process of construction, levels of noise/sound must increase in the construction sites.

202. Project "Investment and Development of Water supply system along Lang Hoa Lac Road (Within Hanoi City limits) transferring treated water from Da River WTP" will be implemented in relatively large areas. The project contains one BPS, a network of clean water transmision and distribution pipelines and a service pipelines network so the impacted areas are located only the areas that pipelines run. In order to limit the negative impacts caused by the construction vehicles and machines in the process of construction to the local residents health, it is necessary to implement the following measures to limit:

- Regularly checking the construction machines in order to always operate in the best state to meet the standard in noise and vibration.
- Trucks, mechanical vehicles and machines used in the process of construction must be tested in noise, sound and vibration. This must be regarded as criterion criteria in the tender documents.
- Avoid the use of too old vehicles to transport the materials, wastes and too old machines to construct.
- Avoid overload transport.
- It will be necessary to avoid building in living hours from 11.30 to 13.00 and from 22.00 to 6.00 in order to avoid impacts to the nearby residential areas (especially ϕ 800-1200mm transmission pipeline No. 1 along National Highway No. 70, section of Nhon – Thang Long avenue – Ha Dong – Van Dien).
- Plan construction in order to limit noise and vibration generated from the unavoidable source during hours when less people concentrate in the impacted areas of the project.
- Equip workers with hearing protection when .

b. Measure to limit environmental pollution and dust

203. The environmental pollution will be one of the major impacts during the construction process of the project. The following measures are proposed to limit air pollution in the construction sites:

Measures to limit dust pollution:

- Cover tightly all vehicles transporting the construction materials (sand, soil, stone, etc…) to avoid spreading dust.
- Avoid long storage period of material on site and immediately refill the roadbed, pavement and the ground to avoid small particules to be wind blown.
- Storage areas must be covered by canvas or put in the lean-to (tent) to avoid spreading the materials to nearby rivers, cannals, farming fields, ponds. The construction materials must be covered tightly to avoid spreading sand, soil due to wind or losing the construction materials in the construction process.
- In sunny or dry days, water regularly in the working areas to limit dust lift in the air.

- Fully equip workers with labor safety tools and equipment for example helmet, gloves, comforter, boot and other labor safety equipment to avoid dust, harmful gases, toxic corrosive materials related impacts and labor accident.

Measures to limit pollution due to exhaust gases

204. In the process of asphalting the road or smearing bitumen on the exterior of pipelines the implementation will always be done out in the open air. Therefore, exhaust gases and pollutants will rapidly spread and dilute into the air. The project will also take temporarily measures to cover or shield the workspace to avoid spreading the pollution into surrounding areas in order to avoid impacting the health of the community.

205. Also, exhaust gases generated from transportation vehicles also contain pollutants/gas wastes including dust, SO2, NO2, CO and CO2. To limit the pollution from these sources, the following measures must be taken:

- Comply with the regulations on labor safety when making the plan of construction including measures to excavate soil, land; measures to arrange machines, equipment; measures to prevent the labor accidents due to exhaust gases; arrange warehouses, storage sites, temporary tents, logistics, etc...
- Reasonably arrange the transport and travel paths; erect fences for isolating dangerous areas, inflamable fuels and exposives; plan lighting of the working areas at night and as a mean of security for the project; cover and shield the areas generating dust; and water/irrigate the traffic network in dry season.
- Technical document of all machinery on site should be available on site andchecked regularly. All vehicule on construction site must have the proper fire alarm light, warning light and other necessary warning signs according to their type operation.
- Workers must wear at all time the required safety equipments such as gloves, safety glasses, helmet, safety boots,…
- Incident prevention vehicles and labor safety equipment are always ready at the necessary locations to resolve incidents in case of emergency.
- Machineries, trucks and equipment used in the construction process must comply to exhaust gases regulations and meet the national standard of Vietnam in exhaust gases. This is a bidding condition for the tenders that needs to be set by HAWACO.
- Reduce the use of diesel fueled vehicles in order to limit SO^2 discharge.
- Regularly maintain vehicles and machines.
- Clean up the construction wastes as they are produce. Collect and put the wastes into bags, then transport to an authorized dump site.
- Vehicles transporting construction materials must be covered carefully to avoid any spills and dust.
- In the process of construction, limit spreading dust by watering the site and stored loose materials regularly.

206. After completing each stages of works, it will be necessary to implement the acceptance test to put into operation or pass to next sections of construction. There will be a necessity to clean up and re-fill the ground and ensure environmental hygiene.

Measures to limit water environment pollution

207. The causes of tsurface water environment pollution will be mainly caused by rain water overflowing and dispersingwaste, dropped oil and lubricants at site to the surrounding areas;sewage waters generated from workers at site and waste water generated from the process of building parts of the project. It will be necessary to take the following measures to limit the negative impacts:

- For rain water and construction water wastes: build a proper drainage network according to overall planning of drainage in the proposed areas of the project, avoid piling construction materials near the drainage network. Regularly check and dredge the drainage network to avoid blockage.
- For living water waste: use the reasonable number of workers at site in each phase of construction; build latrines in accordance with environmental standard.
- Prevent liquid wastes, especially exhaust lubricants of construction machines and vehicles, mix into water, polluting the environment.
- After completing installation, before putting the water transmission pipelines into operation, it will be necessary to wash and sterilize the pipelines. The washing solutions is chlorine at a concentration between40 - 50 mg per liter of clean water. After the process of submerging, washing and cleaning, the wastewaters with residual chlorine will be discharged into the environment through discharge valves of the pipelines. Depending on the dirtyness of the pipelines; the concentration of residual chlorine might be high or low. However, in general, the concentration is still relatively high and and combined with the precipitated flow it might erode the materials in the surrounding environment which with the residual chlorine will temporarly pollute the water environment, kill the aqua-life system in the surface waters and risk harming people getting in contact with the solution. HAWACO must select and take the location of places discharging and gathering the wastewater into account, so that the impacts to the environment in the areas due to discharging wastewater are lowest. The local authorities, management bodies and representative of local residents need to accept the places of discharging the wastewater. Time points of discharging the water waste must be announced publicly in order to let the local authorities and residentials know.

Measures to control sewage pollution from the workforce

208. Workers excrements are a strong pollutants risk in spite of a low volume. To limit the impacts due to workers sanitary wastes, the following measures should be taken:

- In the process of building the BPS and the clean water transmission pipelines, it will be necessary to build mobile latrines to limit the impacts of excrement on the environment (see the following Figure). This type of mobile latrine do not let the workers wastewater and excrement drain into the environment and can be mobilized from this place to another place. When the container of the latrine is full, sucking vehicles will come and suck the wastes then transport to the permitted areas. Each mobile latrine has two sections, one for men and one for women. The number of sucking vehicles can be increased or decreased depending on the number of workers.

Solid wastes in the construction process

a. Collecting construction solid wastes

209. The construction wastes must be gathered and classified into groups and treated as following:

- Volume of leftover soil from excavating and refilling the trenches might be a source of pollution because the process of excavation, refilling and transportation will generate a lot of dust. This volume of leftover gravelly soil should be used to level the ground of the nearby depression areas of the project.
- Other wastes such as paper bags, plastic container, plastic rods, etc… should be classified into groups for selling to the recycling facilities.
- Take advantage of volume of surface soil to level the ground of the farming areas surrounding to limit the transportation.
- Waste fuels/lubricant oils from construction machines must be stored into special containers to avoid spills. To limit negative impacts due to waste lubricants and fuels during the construction process all fluid management should be made at a proprer maintenance facility. If on site repairs are necessary the maintainance areas must have a waste collection system for lubricants and fuels.
- Waste lubricants and fuels must be collected into proper containers and disposed according to state regulations.
- Avoid any storage of construction materials and fuels near any drainage networks to avoid lossses and leaks which could pollute of block the sewage sytem.

210. Workers will also produce domestic waste on construction sites. Wastes such as wrappers, papers and unwanted food volume will not be important, therefore, measures to control are:

- To request workers not to leave litter after meals.
- If it's necessary , all living wastes from workers temporary quarters must be collected and stored into wastebaskets of a volume of 1000 L. PMU will employ the waste collecting and treating companies to transport and sort them daily, transporting to the permitted dumping ground of the city.

a. Traffic management

211. The clean water transmission pipelines installation sites are usually under the road-bed in order to limit the compensation cost. Dispite the fact that the width of trenches to put pipelines are usually narrow, population density of roadside areas can be crowded and the density of traffic vehicles relatively high. To limit the negative impacts to the traffic in this process, the following measures must be taken:

- Cooperate with traffic police to divide the traffic lanes/streams when implementing the clean water transmission pipelines along the narrow and crowded roads.
- Erect warning signs on site and at places where accidents could occur. At night, it will be necessary to have warning lights and flagmens.
- For sections of the clean water pipelines built in areas with low population density, the construction should be implemented at night to limit the impacts on the traffic.

b. Environmental hygiene and labor safety in the construction process

212. Basic measures to protect the environment, labor safety and workers health in the construction process are:

- Plan construction and arrange the number of workers, section by section, one after another, avoiding overlapping the construction phases.
- To apply the advanced construction measures; mechanize the construction process at the maximum level.
- To comply with the regulations on labor safety when planning to implement the project, for example measure to excavate land; to arrange machines and equipment, measures to prevent electrical accidents, order to arrange warehouses, ground for gathering the construction materials, temporary tents.
- To apply measures to ensure labor safety when making the schedule of the implementation: time and order of building the project must be ensure stability of item works, to reasonably arrange the sections of building to limit transportation. The ground of building should be reasonably arranged to avoid hindering each other.
- To ensure the material facilities for example kitchen, bathroom, clinnic, latrine,…serving workers at site.
- To reasonably arrange the travelling paths.
- To design fully the lighting system at places needing to work at night.
- To equip fully workers with the necessary equipment of labor safety for example protective clothes, helmet, gloves glasses, boot, etc…to limit the impacts to workers.
- To establish the medical department being on duty at site.
- To prepare necessary tools and addresses in case of emergency: water waste discharging valves, medical box, eye washing tools, oxygen mask, addresses and phone number of hospital, firefighter, etc…
- To comply with the regulation on the project safety, fire, explosion and protection of the existing law.
- Because there are many trees in the construction sites, it will be necessary to limit to impact to the trees, preventing trees from collapsing, especially in the rainy season, leading to accidents.
- The construction sites must have the certificate on already detecting and disposing mines and bombs before building the project.

c. Measures to limit social affairs

213. In addition to land compensation and clearance, to limit social affairs during construction, the project should coordinate the implementation of the following measures:

- The construction phase will last over a long period of time and it will impact significantly the environment of the local residents. Measures to limit the impacts onthe community health must be considered seriously. In order to prevent any social matters likely arising from the relationship between foremen, workers at site and the residents, the PMU, Contractor should coorperate with the local authorities and local security guards at all levels, timely propagandize, supervise, warn, found and threat any misbehavior.

- Announce the schedule and timetable of the project whereabouts such as material transportation routes and construction site locations;
- All workers must wear ID card when travelling in/out the construction sites in order to be convinient to manage.

c. Measures to prevent and limit the negative impacts to the environment during the project's operation

214. The negative impacts to the environment in the operation process of Project "Investment and Development of Water supply system along Lang Hoa Lac Road (Within Hanoi City limits) transferring treated water from Da River WTP", if occur, will mainly be at the BPS and the clean water transmission pipelines.

a. For the BPS

215. To maintain clean water sterilization standards, it will be necessary to chlorinate the outgoing waters from the BPS. Usually Son Tay BPS will use sodium hypochlorite (NaClO) to sterilize supplied water. NaClO, when misused, is a dangerous chemical with described as a strong and unstable oxidant, easy to decompose to generate chlorine and other subsubstances. It is recognized as having high toxicity to humans and the environment.. NaClO is easy to decompose in environments with a ph between 6 and 7 by the contact of metals including Fe, Ni, Co, Cu, Mn and metallous oxides, sunlight and temperature. Active chlorine is generated from NaClO can cause damage to the respiratory system, leading to choking and death if inhale at a high concentration. To limit the negative impacts when operating Son Tay BPS, it will be necessary to take the following measures:

- Containers of sodium hypochlorite (NaClO) must be made of CPVC, HDPE or any opaque alkali-resistant materials.
- Containers must have a safety lid to avoid leakage or evaporation.
- NaClO warehouse must be spacious, dry and sheltered from the elements. The temperature in the NaClO warehouse must be always lower than 35 $^{\circ}$C.
- NaClO overstock should be avoided since the preservation period is not longer than 60 days.
- Wear gas mask when working with sodium hypochlorite (NaClO). When someone inhale chlorine, it will be necessary to bring the worker outside the building, loosen its clothes and then quicklysend himto the nearest clinic center. Avoid providing artificial respiration to prevent any lung damage. If the person is uncounsious, have someone call an ambulance for transport.
- It will be necessary to wear labor safety equipment for example the protection boots, glovesand full-face visor.
- It will be necessary to wash off the places NaClO has been spilled.
- If NaClO come in contact with the eyes or on the skin the affected area must be rinse abundantly with clean and cold running wateruntill no sensation of itch (for the skin) or for a 5 to 10 minute period in the eye. After, the worker will be sent toa nearby clinic center to treat further.

216. Son Tay BPS is located near a residential area., During the operation process, the high capacity will generate noise, that could impact significantly to the nearby residents health and living conditions. Therefore, the room where the pumps will be installed must have a noise suppressing capacity.

217. The clean water reservoir at the BPS will have a capacity of 6.000 m^3 divided between two tanks of 3000 m^3 capacity, built with reinforced concrete and buried half way in the ground. If a failure, a crack, would appear in the future and if the water level in the reservoir is lower than the level of the water surrounding the reservoir groud water could infiltrate the reservoir. The areas surrounding the reservoir are farming land and there are many graves in these areas. Underground water at the low layer likely contains organic substances that might also permeate into the clean water reservoir. To limit the negative impacts, the implementation of building must be comply with the Decree No. 209/2004/NĐ-CP dated December 16, 2004 by Government on the management of the quality of the project. Besides, the quality of the water in the reservoir must be regularly tested to monitor the reservoir integrity and act if any problems would occur. A daily above ground inspection of the integrity of the reservoir should be mandatory. The water quality criterias needed to be tested are minimum turbidity, permanganide, E.coli and total coliformand for excessive amount of chlorine.

218. Concerning impermeability of the reservoir, HAWACO should consider coating the inside of the reservoir with a non-reactive liner that would prevent interaction between the clean water and theconcrete. It will also provide a barrier against potential infiltration.

a. For the clean water transmission and distribution pipelines

219. Pipelines might be cracked or broken in the process of washing the pipelines, aging or faulty design impacting negatively on the clean water transmission and distribution pipelines in the operation process. To limit the negative impacts, HAWACO need:

- To regularly check the state of operation of equipment and works on the pipeline network for example the lids of valves, firehoses, gas valves in order to detect damages, depression, leakages and other incidents, especially at crossing points between pipeline and bridge, railway, etc…
- To regularly monitor the state of operation of the network, regularly measure the pressure at the necessary points.
- To quickly repair the leaks after receiving the information.
- In the operation process, the water supply pipelines might be washed to remove the organic or inorganic sediments. Washing these sediments must be carefully calculated and must be taken the most reasonable method, depending on the state of depositing sediments in the pipelines. In case of using solution HCl (8%-10%), it will be necessary to calculate to limit the lowest excessive amount of acid. Places of i the waste water dischargemust be in authorized places and absolutely not into fishponds, crop fields or rice paddy fields.

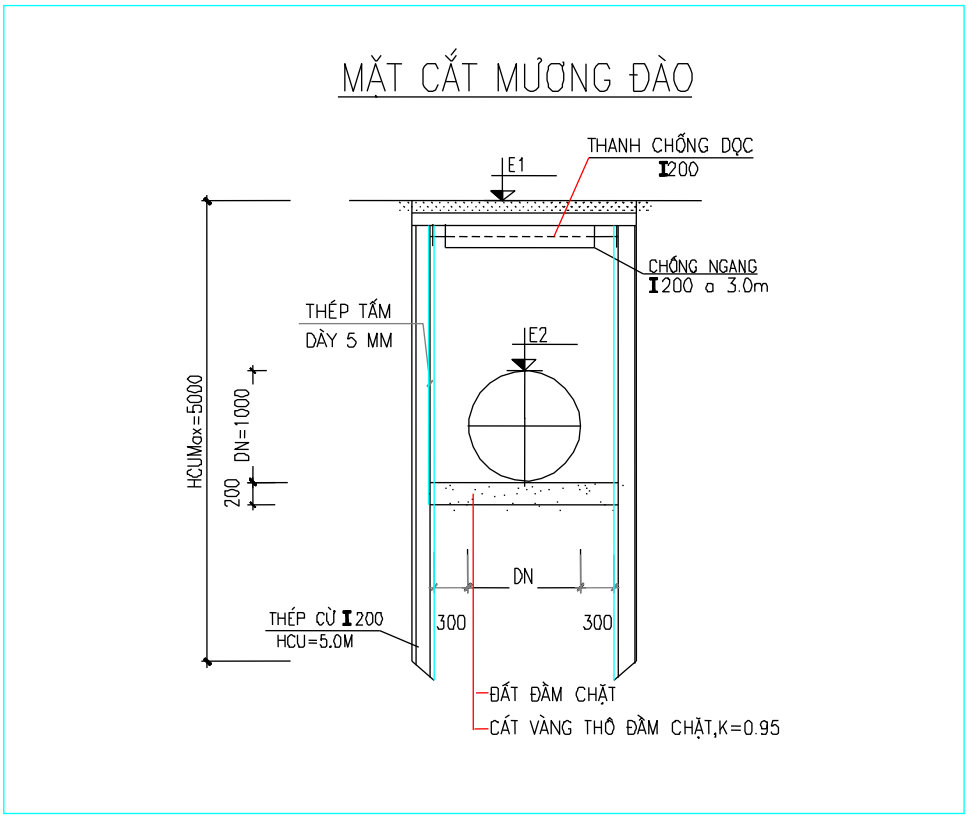
220. When incidents in the pipelines occur, it will be necessary to turn water off from small valve to big valve according to the drawing of valves. To put all air out of the pipelines, valves must be opened slowly, from the lowest valve to higher ones.

d. Measures to prevent and respond to the potential incidents

221. For preventing and responding to incidents of the landslide and the ground depression in the construction process, it will be necessary to take following measures:

- For limiting landslide and ground depression when building Son Tay BPS and the clean water transmission pipelines, contractor must apply the approved measures. For the process of building and installing ϕ 900 – 1200 mm pipelines of water transmission, and for limiting the landslide and the ground depression when excavating trenches for pipeline installation, the structure of trenches should be designed according to the following figure. Building the BPS and clean water transmission pipelines must be implemented in compliance with the approved design, drawing and plan. Layers of the materials for supporting and refilling the water transmission pipelines must be according to the approved design and drawing and should not be replaced by the original gravelly soil. When leveling the ground, it will be necessary to comply with the existing structure of road.

Figure 8 Structure of trenches for ϕ 900 – 1200 mm pipeline installation



- Regularly monitor the depression of the clean water reservoir of 6.000 m³ of the BPS in the operation process.

222. For preventing fire, explosion and electric short circuit incidents in the construction and operation processes, it will be necessary to take the following measures:

- When it is raining, do not allow workers to shelter from the rain under tall trees along the roads.
- During the rain season, risk of lightning storm stricking the BPS could occur and especially the transformer station and the most inflammable areas like the chlorine

warehouse. Therefore, the station must have an active lightning protection system. The ground connecting wires must have a maximum resistance of 10 Ohm when measured in the dry season of the year. Cables/wires and the ground connecting stakes must be welded by the thermochemical CADWELD method to ensure no defects at welding points.

- Avoid excessive use of power equipment that will consume the BPS electrical capacity to the crash point of the rated power consumption at Son Tay BPS.
- Pay attention to monitor the temperature of the pumps so it stays in the optimal range.
- Damaged or old wires should be replaced with new ones to avoid fire hazards and short circuit.
- Absolutely not use iron wires or nails to tie the electrical wires. Wires linking to plugs, lampholder and machines must be firm and their end of hot wire must not be linked with the end of cool wire.
- For preventing fire incidents due to bad condition of the ground wire connection , the connecting points must be in compliance with the technology. If it does happen, a survey of the various connection should be done. No object should ever be hanged on the wires. The electric wires, pulses and circuit breakers must not be rusted.
- When turning the engine on and it does not run, it will be necessary to turn it off to repair promptly in order to avoid blowing out the engine. In firing, there is always electric blue flash, burnt smell of ozone in the air or burnt smell due to burning the insulation plastics. Electric fires tend to be small but dangerous. Before extinguishing, it will be necessary to cut the electric power source. When fire develops strength, it depends on the facts of the situation to decide the suitable extinguishing methods. When cutting the electric power, firemens must be equipped with the appropriate protective tools including insolated sticks, boots, gloves and scissors. These tools must have the label of permitted voltages according to the situation to attend.

223. Measures to prevent and respond to the traffic:

- Vehicles use to transport pipelines, sand, soil and other construction materials must meet the technical and safety requirements and have been tested, approved and granted the license for operation by authorities.
- Vehicles to transport must be tested and equipped with the properequipment as well as respect their permitted loads and permitted speeds.
- Warning signs of works: warning signs, speed limit signs, navigation stakes, flickering lights, etc… are designed in compliance with the regulations of the charter of road signs issued by Ministry of Transport.
- For managing vehicles and ensuring to divide the traffic lanes/streams: when needing to guide the traffic, it will be necessary to arrange the flagmens to guide the traffic in and surrounding the construction sites. In the transport process, monitoring the traffic should be organized with the local authorities and agencies/organizations around the construction sites.

224. Measures to ensure labor safety in the processes of construction and operation of the water supply system:

- Workers at site must be fully equipped with labor safety kits, first-aid kit and protective

clothing and they must be trained in labor safety.

- Workers operating machinery and equipment must be trained in the principles of the technical operation and maintenance. Workers handling sodium hypochlorite (NaClO) must be equipped with a protective suit paired with an active carbon gas mask and a full face shield.
- Ensure the implementation of the regulations on labor safety, especially for heavy, dangerous and harmful jobs.
- When labor accidents occur, it will be necessary to apply the trained methods of first aid before bringing the victims to the medical clinic.
- For the traffic accidents, it will be necessary to erect the warning signs and evacuate the victims out of the accident areas if possible and only if they are in immediate danger then inform the relevant information to the office for help.

225. Measures to prevent and respond to incidents of chemicals in the operation process at Son Tay BPS:

- Avoid having any edible items when managing NaClO. When working in the NaClO warehouse, the workers must wear gas mask, rubber gloves, boots, faceshield and other protective equipment according to the existing regulations. Workers handling NaClO must understand the characteristics and toxicity of the product and be trained in specific first aid measures related to it.
- For the process of keeping and preserving NaClO: the chlorine warehouse must be located in the isolation area in a single level building and a ventilation system. Electrical switches must be designed out of the warehouse; the temperature in the warehouse must bekept under 35°C. There must not be any inflammable materials or fuels surrounding the warehouse. The ground of the warehouse must be flat and smooth and easy to drain. The warehouse must be fully equipped fire resistance tools and fire protective equipment (fire extinguisher). Closely monitor the operation of the warehouse in order to prevent NaClO spills in the environment. Also, the operation processes surrounding the chlorine warehouse must be compliant with labor safety regulations.

226. Measures to prevent leaks and breaks of the clean water transmission pipelines:

- The pipes and assembling parts must be compliant with the quality requirement as designed. It will be necessary to test the quality of the pipes and the assembling parts before the installation.
- In the construction process, the damaged, cracked and broken pipeline sections must be replaced with new ones. There must not be defects in quality of pipelines and assembly parts.
- The transmission pipelines will be equipped with manual and / orelectric valves. In case of a break in the pipelines, it will be necessary to use these valves to turn water off then inform the technicians to repair as soon as possible.
- For the distribution pipelines, to ensure to supply safely water and to repair when incidents occur, it will be necessary to design valves in order to be convenient operate and manage.

227. In case of breaking the clean water transmission pipelines of Da River water supply network (had happened before), HAWACO have to contact immediately with VIWASUPCO in

order to know the situation of the incident and the direction/capacity of repairing the incidents of VIWASUPCO, and inform immediately the water consuming HHs of the affected area, so that the residents can prepare temporary measures.

VI. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

228. Information disclosures and public consultation on environment ensures the participation of local authorities, relevant parties and community in the project area. Public participation is one of the basic conditions that ensure the community's support for tha project and that the project implementation is sustainable and favorable. In addition, Community consultation on environment and positive attendance will reduce negative impacts and environmental problems which environmental consultant team has not recognized. In fact, if the communities take part early in the project preparation, the relationship between them and the project officials becomes closer. From that, communities can contribute valuable comments and suggestions to the project.

229. Public consultation during preparation for the project's IEE report should be designed in such a way with aim to:

- Achieve compliance with the requirements in clause 8, article 20 of Environmental protection law No. 52/2005/QH11 dated 29/11/2005
- Comply with Decree No. 29/2011/NĐ-CP relative to regulations on SEA, EIA and EPC; and
- Meet requirements in Circular No. 26/2011/TT-BTNMT dated 18/07/2011 by Minister of Natural Resources and Environment.

230. The purposes of public consultation are as follows:

- Share information about project components and project proposed activities with community at project area and relevant enterprises.
- To collect opinions; understand the concerns and sensitivities of local authorities and community on environmental problems created in project area; especially problems which are not recognized by IEE preparing team. Based on this, public cares can be reasonably settled during the course of setting up the Project, and selection of designing solutions
- To perform thorough and comprehensive evaluation of all environmental impacts and propose the most impactive mitigation measures that exactly address the adverse environmental impacts.

231. For this project, the PMU, in close collaboration with the consultants, conducted public consultation with all People's Committees and local communities of 38 communes and towns in Thach That, Quoc Oai and Hoai Duc District of the project areas. This is to ask for their comments and suggestions on environmental impacts of the project (see the Appendices for more information on public consultation).

232. Contents expressed in consultation meeting include:

- Project information disclosure: providing participants with project-briefing documentation, and construction map of different project components in different locations.
- Disclosing tasks and plans of consultant on environmental impact assessment of the project.
- Consulting leaders and affected people to ask for their comments and suggestions on environmental problems: discussion at the meeting

A. Opinions of people's committees at commune level

233. The following Table summarized the opinions of people's committees at communes and wards that were consulted.

Table 29 Summarized opinions from the local authority

No.	Opinion from the local People's Committee	Opinion from PMU and Consultant
Son Tay town		
1	**Xã Sơn Đông:** Support the project; wish the project will be implemented as soon as possible. Implement fully the measures to protect the environment in the process of building the project (limit dust, noise...) There should be warning signs, wall/fence to limit impacts to the resident living nearby	Agree with the opinion contributed by People' Committee of commune Son Đong. The implementation of measures to limit negative impacts to the environment has been mentioned in Charter "*measures to limit the negative impacts*" in the IEE report, and will be regarded as requirement in invitation document.
Hoai Duc district		
2	**Tram Troi town** Only be impacted temporarily in the process of building. It is necessary to have measures to refill the excavated ground as soon as possible after building.	PMU agrees and receive the opinion contributed by the communal People's Committee.
3	**Van Con commune** Support the project. Should pay attention to the impacts in the process of excavating trenches for installing pipelines. It will be necessary to have measures to refill the excavated ground as soon as possible after building.	Commit to the implementation of measures to protect the environment.
4	**An Thuong commune** Impact to the collective security in the local area in the process of building and installing the pipelines. The construction organization must strictkly implement the measures mentioned in the IEE report of the project.	PMU agrees and receive the opinion contributed by the communal People's Committee.
5	**Lai Yen commune** Support the project. Wish the project will be implemented soon and put into operation. The process of building will impact the traffic temporarily in the local commune. Impacted by dust, noise when implementing the construction. Level the ground after completing the construction. Announce the plan to build to the local authority and residents.	PMU agrees and receive the opinion contributed by the communal People's Committee. The environmental impacts have also been estimated in the IEE report of the project.
6	**Van Canh commune** In the process of building, the local residents will be impacted temporarily by dust; the travelling in the local commune will be impacted. Implement quickly the construction and level the ground after completing the construction.	Contractor will level the ground and clean the working site after building.

No.	Opinion from the local People's Committee	Opinion from PMU and Consultant
7	**Son Đong commune** Support the project, wish the project will be implemented soon and put into operation. Comply seriously with commitment to environmental protection. The process of building will have negative impactslike dust, noise, impact to the traffic and the social order/collective security. Should have measures to limit the negative impacts for example building in manner of section by section, one then another.	PMU agrees and receive the opinion contributed by the communal People's Committee, UBMTTQ.
8	**Tien Yen commune** When implementing the construction, dust and noise will be spread, impacting to the traffic. Construction and ground levelling should be implemented quickly after completion.	PMU agrees and receive the opinion contributed by the communal People's Committee. Contractor has to commit to ground leveling after building.
9	**Đac So commune** Support the policy on the implementation of the project. Impacts will mainly be arised in the process of building. Construction and ground levelling should be implemented quickly after completion.	Contractor has to commit to ground leveling after building.
10	**Yen So commune** Publish information on the project, have the plan to satisfactorily compensate the impacted HHs farmland loss. Announce the local authority about the schedule, timetable and measures in the process of building. Should pay attention to limiting impacts to the local residents living environment when starting the construction. The process of leveling the ground needs to ensure the traffic.	Will implement an announcing system to inform the residents on the project announce the potential impacts and measures to limit/respond.
11	**Song Phuong commune** Construction and ground levelling should be implemented quickly after completion.	Agree with the opinion contributed by communal People' Committee.
12	**Minh Khai commune** Main impacts: dust, noise, wastewater and septic wastes of workers at site; the internal traffic in the commune will be impacted. Should manage workers closely. Construction and ground levelling should be implemented quickly after completion.	Agree with the opinion contributed by communal People' Committee. Measures to manage the workers at site have also been mentioned in the IEE report.
13	**Communes of Duong Lieu, Cat Que, Đuc Giang, Đuc Thuong, Di Trach, Kim Chung** Support the politic implementation of the project. Construction and ground levelling should be implemented quickly after completion.	Agree with the opinion contributed by communal People' Committee.
Quoc Oai district		
14	**Quoc Oai town** Support the project. Should advertise the project to the residents as well as the environmental impacts caused by the project. Only have temporary impacts in the process of building. Fully implement measures to limit environmental impacts.	Have had the report on the environmental impacts and proposed measures to limit/respond, have announced to the local residents. Have asked for opinion about the environmental impacts by the project from the local residents. Commit to the implementation of measures to limit/respond environmental pollution.

No.	Opinion from the local People's Committee	Opinion from PMU and Consultant
15	**Ngoc Liep commune** Impacts due to the process of building. Quickly level the ground after construction so that the local residents will be convenient to live, produce and do business.	PMU agrees and receive the opinion contributed by the communal People's Committee.
16	**Ngoc My commune** Support the project. Advertise the environmental impacts caused by the project to the residents, and the measures to respond them.	Have had the report on the environmental impacts and proposed measures to limit/respond, have announced to the local residents. Have asked for opinion about the environmental impacts by the project from the local residents.
17	**Đong Quang, Thach Than, Liep Tuyet, Yen Son, Phuong Cach, Can Huu, Sai Son communes** Support the project, need to announce the information about the project to the residents. Apply the proposed measures to limit the impacts in the process of building.	Have had the report on the environmental impacts and proposed measures to limit/respond, have announced to the local residents. Commit to the full implementation of measures to limit/respond to environmental pollution.
18	**Nghia Huong** Propose that owner/investor must have the measures to ensure environmental hygiene. The project should be implemented soon in order to avoid impacting the residents lives, production and businesses. Need to construct quickly, in manner of section by section in order to level the ground for traffic and ensure that the environment will be similar to the original situation.	PMU agrees and receive the opinion contributed by the communal People's Committee.
Thach That district		
19	**Huu Bang commune** Currently, do not have a demand for the investment in the water supply system. However, the area has a clean water trading enterprise that meets the demand for the clean water of the local residents.	Receive the opinion from the communal People' Committee, however, the investment in this clean water supply system will be to meet the long term target, ensure the capacity of supplying the clean water to the local residents in the future when population size and socio-economic development will grow.
20	**Phung Xa, Thach Xa, Binh Phu, Kim Quan, Chang Son, Huong Ngai, Canh Nau, Di Nau, Can Kiem communes** Wishes the project will be implemented soon in order to meet the demand for the clean water of the residents. The environmental impacts is only temporary during the process of building. Re-level the ground after completing the construction. Propose seriously implementing the above mentioned measures to limit the impacts in the report.	Commit to the full implementation of measures to limit/respond to environmental pollution.

B. Opinions of representatives of local communities

234. The following Table summarizes the content of the opinion contributed by the local residents in surveyed communes, districts. The minutes of meeting to ask for the local residents' opinion is presented in Index.

Table 30 Summarized opinion from the local residents

Opinion from the residential community	Opinion from PMU and Consultant
Agree to support the project. In terms of social impacts to the activities of revoking land in Dong Son commune, Son Tay, there is opinion saying that: after revoking land, the remaining areas is too narrow, not enough to cultivate, so propose on revoking the remaining land areas. Propose keeping the water supply cannal to irrigate in the revoked areas. Should announce the time of implementing the project in order to relocate the graves out of the construction site.	
The living water resources that the residents are using in the communes are resources from rain water and underground water of low quality, so they are highly anticipating the arrival ofof the clean water system. According to opinion from the local residents in some communes including Lai Yen, Đuc Giang, Son Đong..., currently, the water resources that the local residents use are polluted: high turbidity and a high ferrous content.	PMU agrees and receive the opinion contributed by the residential community.
After coming into operation, the water suppy system will bring positive impacts to the society and the economy: the residents living standard condition will be improved, meeting a higher demand for clean water from the residents as well as ensuring the health of the community.	Agree with aspiration of the local residents and receive opinion on the environment.
Agree with the IEE report and the proposed measures to limit/respond of the consultant. In the process of building, activities of excavating roads will generate dust, noise and hinder the traffic. The project will not impact the land and assets of the residents along the pipeline and surely not revoke endlessly the land. The impacts will be temporarily in the process of building and installing the pipelines.	The role of the local community and authority in terms of monitoring the environment in the processes of implementing the project has been mentioned in the approaching diagram of EMP.
Impact to the traffic in the process of building and installing. After completing the construction, the ground should be level quickly in order to avoid impacting to the resident's social and economical activities. The process of building need to be implemented quickly and the sites should be kept clean at all times.	Implementing the project will comply with the regulations on the environmental safety of the Asian Development Bank (ADB) and Vietnamese government.
The process of building, if damaging the public works or the collective works such as collective roads, etc…, should be repairedupon completion of the various sections. Water should be sprayed on the road sections of building/running through the crowded residential areas in order to avoid impacting to the activities of living and doing business of the local residents. Will impact the social order and the public/collective security at the construction sites. Must be responsible for cleaning the worksites. Proper waste managment should be well organized on site. Need to announce the plan, schedule, and locations of building to the local authority and residents. Need to cooperate with each local authority and residents in order to ensure the social order and the public security. The contractor should well manage the workers at site. Divide the traffic lanes/streams, have flagmens direct the traffic when excavating and installing pipelines, avoid creating traffic jam, avoid cratinglabor accidents.	Matters of the traffic, managing the wastes and leveling the ground have been mentioned in sections of the proposed measures to limit/reduce/respond the environmental impacts in the IEE report and will be regarded as a requirement in the docucment of invitation.

C. Feedback information and commitment by HAWACO of the project to proposals, requirements by consulted organizations and agencies

235. Responding to proposals and requirements by the communal People's Committee, the communal Fatherland Front of Hoai Duc district, Quoc Oai district, Thach That district and the local residential community of the local communes and towns in terms of the implementation of Project "Investment and Development of Water supply system along Lang Hoa Lac Road (Within Hanoi City limits) transferring treated water from Da River WTP" HAWACO have some opinion as following:

- Receive all opinion contributed by the communal People's Committee, the communal Fatherland Front, the local residential community in the communes and towns in the proposed areas to build the project;
- Commit to monitor closely the sources of environmental impacts during project's construction, and to have the measures ready to reduce/limit/respond to any environmental pollution.

D. Consultation during EMP Updating

236. Consultations will be conducted with AHs affected by the BPS during the updating and implementation of the IEE and EMP. Consultations are to be inclusive of all social & environmental agencies and individuals.

237. Consultation will continue through all the project duration through regular public meetings.

E. Disclosure of Information

238. IEE and Environmental Management Plan will be translated in Vietnamese and will be made available at the office of the People's Committees (PC) of the communes and ward of the 3 dstricts of Hoai Duc, Quoc Oai and Thach That as well as Song Dong commune included in the area of influence (see Table 23).

239. IEE and Environmental Management Plan will also be uploaded in ADB website in compliance with Public Communication Policy (PCP) 2012.

VII. GRIEVANCE REDRESS MECHANISM

240. During project operation, HAWACO shall comply with the provisions of the law on environmental protection, construct BPS facilities, timely and in good coordination with all local authorities lay the clean water pipeline grid, limit the negative impacts on environment and protect community health. The company should be proactive to assure that sufficient resource from the Da River will be available in order to avoid disturbance due to a shortage.

241. The mechanism described below follows the procedure adopted also for raising and resolving grievance in the resettlement and the social development report. As a guiding principle, grievances related to any aspect of the Project will be handled through negotiation aimed at achieving consensus. Complaints and grievances will pass through three levels of entities, which have the potential to resolve the situation, before they can be elevated to a court of law as a last resort. HAWACO will shoulder all administrative and legal fees that might be incurred in the resolution of such grievances and complaints.

242. The first stage venue for raising and resolving complaints and grievances is the Commune/Ward People's Committee (CPC). An aggrieved party may bring its complaint or petition before any member of the Commune People's Committee, either through the village chief or directly to the CPC, in writing or verbally. Grievances may also be raised during follow-up consultations and interviews with local residents during construction. It is incumbent upon said member of CPC or the village chief to notify the CPC about the complaint. The CPC will then meet personally with the complainant and will have 15 days after the lodging of the complaint to resolve the complaint. The committee may obtain the assistance of the Hanoi Environmental Protection Agency in evaluating the technical basis of complaints related to environmental impacts. The CPC secretariat will be responsible for documenting and keeping a record of all complaints that are lodged with the committee. A complaint form template is available in Annex 8.

243. If not resolved in the first stage above, the second venue for grievances is the District People's Committee (DPC). That is, if after 15 days the aggrieved party or complainant does not hear from the CPC, or if the complainant is not satisfied with the decision taken on the complaint, the affected party may bring the case, either in writing or verbally, to any member of the DPC or the District CRC. The DPC in turn will have 15 days following the lodging of the complaint to resolve the case. The DPC secretariat is responsible for documenting and keeping a record of all complaints that are lodged with the district committee.

244. The third stage is the City People's Committee (CPC). If after 15 days the aggrieved and affected party does not hear from the District People's Committee, or if the complainant is not satisfied with the decision taken with regard to the complaint, the case may then be brought, either in writing or verbally, to any member of the City CPC or the City CRC. The City CPC has 15 days within which to resolve the complaint to the satisfaction of the concerned parties. The City CPC secretariat is responsible for documenting and keeping a record of all complaints lodged with the committee.

245. In the event that the grievance remains unresolved even after being raised at the level of the City People's Committee, the final resort is the Court of Law Arbitrates. Specifically, if after 15 days following the lodging of the complaint with the City CPC, the aggrieved party does not hear from the City CPC, or if the complainant is not satisfied with the decision taken on the complaint, the case may then be brought to a court of law for adjudication.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

246. The environmental impacts and mitigation measures for the proposed project were described in Section V above. This section summarizes the significant impacts and mitigation measures with attention to key items to be monitored, the implementation set-up and assignment of responsibility, and the required budget.

A. Project components

247. The Lang Hoa Lac Road project consisted of the following components:

- The construction of a booster pumping station in Son Tay sourced by the water treatment plant of Da River, property of VIWASUPCO, with a transfer capacity averaging 30,000 m³/day (Technical max: 55,680 m³/day);
- The construction of a transmission and distribution pipeline D400 to D1200 of 81,515 m in concrete and HDPE pipes
- A distribution grid DN90-DN300 pipes for a total length of 443,65 km
- Installation of D50-63 service pipes for a total length of 969,12 km
- The connection of 88,102 houses with meters;
- Installation of 532 fire hydrants;
- Installation of nine (9) main water meters on DN500-100 major water supply pipes and inter-regional connections;
- Installation of fourty-five (45) secondary water meters on DN200-50 water supply pipe for the commune.
- The construction of office building and auxiliary facilities;
- And support for the implementation and operation of the project;

B. Institutional Arrangment and Responsabilities

248. The project will be managed and implemented in compliance with the regulations of the Government of the Social Republic of Vietnam, Asian Development Bank (ADB) and the Vietnam-ADB signed credit agreement.

249. The project governing organization: Hanoi People' Committee will be the project investor. Hanoi People' Committee will be the Vietnam side's organization authorizing to approve the project and the relevant documents. Hanoi People' Committee through its relevant departments for example Hanoi departmenet of planning and investment, Hanoi department of construction... will direct the implementation of the project from the preparation process for investment to the process of the implementation of the project according to capital borrowing agreement signed with ADB.

250. The owner of the system is HAWACO. The company will be in charge of implementation of the project. HAWACO will be assigned tasks of managing and using the capital of investment and development of the project according to the direction of Hanoi People' Committee.

251. Project Management Unit (PMU): After authorities approval about the project and signing the capital borrowing agreement, PMU will be the Owner's representative. PMU will directly

organise and implement the project untill the item works of the project would be tested for acceptance and put them into operation.

252. Key duties of the PMU are summarized as follows:

- Implement the land compensation and the ground clearance according to the responsibilities of Owner.
- Assess the technical design, planning and drawing of building; and estimate volume and size of each item works.
- Select Contractor in the process of construction.
- Manage the quality, volume, schedule and cost of investment of each item works.
- Ensure labor safety and the environemental hygiene at site.
- Set up the ceiling and unit price of building works.
- Check and test the quality of building materials, assess the quality of the works according to the request of Owner.
- Assess and recorgnise meeting the quality standard of the works.
- Test for acceptance, pay and complete the contract; pay and disburse the investment capital of the works.
- Test for acceptance, transfer the works.
- Implement the opening ceremony; propagandize and advertise about the works.
- Implement some other affairs of management.

253. Apart from above mentioned organizations in mainly charge of managing the project, there are Government's professional organizations, Hanoi departments/agencies relating to the process of arrangement and implementation of the project.

254. The Monitoring consultant will be requisitioned to provide environmental monitoring support during project construction, using as baseline the environment survey that was conducted as part of this IEE. The Center will undertake sampling and testing of surface water, groundwater and ambient air quality along the pipeline construction corridor three times per year during the construction period. The Monitoring consultant will also conduct follow-up consultations and interviews with local residents to identify concerns or grievances arising during construction. The Monitoring consultant will report its findings to HAWACO, and later will relay the findings to the Hanoi PC and DoNRE.

255. Safeguards compliance monitoring during the construction phase - particularly compliance with safeguard measures specified in construction contracts, as recommended in this report--will be incorporated in the duties of the construction supervision company to be engaged by HAWACO (and supervised by the PMU). The compliance inspections and audits will be documented, and findings and recommendations for corrective measures submitted to HAWACO. During the operation phase, HAWACO will be responsible for safeguards and effluent monitoring, and the findings will be reported to the DoNRE.

256. The Hanoi Environmental Protection Agency will conduct random environmental monitoring and inspection before, during, and after construction, as well as in the event of emergencies. It will also review the monitoring reports of the Monitoring consultant. If

abnormalities are found, the DoNRE may impose fines and issue a notice of rectification with a specific deadline to the responsible entities. If complaints are formally received from the public through the People's Committee, the Hanoi Environmental Protection Agency will carry out verification inspections, as described in the grievance redress mechanism.

257. Within three months after the construction completion or no later than one year, an environmental acceptance monitoring and audit report on the completion of the project components will be prepared by a qualified environmental institute, e.g., Technical Resources and Environment Co., Ltd One Member. The report will be reviewed and approved by the DoNRE and submitted to ADB.

258. The environmental monitoring, including the environmental benefit monitoring, will be incorporated into the project performance management system (PPMS) indicators for the project. Assisted by a local environment specialist, the PMU will be responsible for analysing and consolidating the data via their management information system. The PPMS will be designed to allow adequate flexibility to adopt remedial actions regarding the project design, schedules, activities, and development impact. At the start of the project, the PMB and consultants will develop comprehensive PPMS procedures for systematically generating the data on inputs and outputs of the project components, and agree on the environmental and related socioeconomic indicators to be used to measure the project impacts. The PMB will refine the PPMS framework, confirm the achievable goals, firm up the monitoring and recording arrangements, and establish the systems and procedures no later than 6 months after the loan takes effect.

C. Summary of Potential Impacts

259. The monitoring specifications described in Table 7 focuses on the potentially adverse environment-related impacts, based on the assessment presented in Chapter V. Benefits associated with providing adequate and safe water supply will be monitored within the project's overall design framework (i.e., the project logical framework).

Table 31 Summary of key Potential Impacts from IEE

Construction Phase	
1)	Excavation work and construction of the BPS in Son Tay will produce spoils with their management risk; constant noise (construction, transport) during construction hours on a site located behind a residential area, displacement of graves
2)	Excavation work for the pipeline trenches will produce spoil; heaps of excavated soil beside the trench could obstruct community access, and erosion from spoil storage areas could silt up nearby streams and drains. Dry heaps could cause dust nuisance
3)	Obstruction to traffic flow during pipeline construction, exacerbated by the narrow road and work spaces: • Local residents could be cut off from the road due to the trench-building; • Increased traffic of dump trucks carrying spoils and materials to disposition sites and from storage areas; • Air pollution from excavation and transport equipment; • Traffic hazard to pedestrians, especially school children and elderly.
4)	Nuisance and public safety hazards caused by pipeline excavation and pipe-laying activities in urban areas
5)	Accidental Detonation of unexploded ordnance (UXO) during pipeline excavations
Operation Phase	
1)	Hazard posed by the management of the NaClO.
2)	Increase in the volume of municipal wastewater generated.

D. Mitigation Plan

260. The monitoring specifications described in Table 8 focuses on the potentially adverse environment-related impacts, based on the assessment presented in Chapter V. Benefits associated with providing adequate and safe water supply will be monitored within the project's overall design framework (i.e., the project logical framework).

C. Environmental Management Plan (EMP)

261. (EMP) of this project is briefed in the following Table.

262. Contractors must be responsible for implementation of mitigation measures during project construction under supervision of PMU and construction supervision consultant (CSC)

263. Implementation of compensation plan for land acquisition during pre-construction (site clearance) will be the responsibility of PMU with assistance from an independent consulting unit. Compensation is estimated to cost 5,823,736,800 VND (equivalent to 279,651 USD)

Table 32 Environmental Mitigation Plan

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Pre-construction Detailed Design Phase								
Confirmation of required resettlement and temporary relocations	No community impacts	1. Affected persons well informed well ahead of project implementation. 2. Accompany the family that will see the graves of their family members relocated from the BPS.	At BPS at Son Tay & along distribution network	Before project implement-ted	See resettlement plan	See resettlement plan	HAWACO / PMU[3]	Resettlement committees
Disclosure, & engagement of community	No community impacts	3. Implement information disclosure and activate grievance redress mechanism (see IEE)	At all construction sites.	Beginning of project	Quarterly	No marginal cost[4]	HAWACO	PMU
GoV approvals	No negative impact	4. Notify DoNRE of project initiation to ensure GoV EIA requirements approved, and obtain required project permits and certificates.	Entire project	Before construc-tion	As required	No marginal cost	City CPC & DDSC[5]	PMU
Detailed designs	Minimize negative environmental impacts	5. Complete detailed designs of: **1)** Son Tay BPS; and **2**) treated clean water pipelines and distribution network that incorporate the following: a) updated review of water availability from Da River WTP during the expansion to ensure that sufficient and sustainable supplies will be available while population expansion continues to assure water supply systems long after commissioning stage; b) re- confirm assertion of IEE that no critical habitat, rare or endangered flora or fauna, or cultural property or values will be affected permanently by any component of the water supply systems; c) minimal acquisition of agricultural land d) no or minimal disruption to water supply, utilities, and electricity with contingency plans for unavoidable disruptions; .	(a-d), Entire project area: 1) BPS and office and 2) and Treated water pipeline and distribution network	Before construc-tion initiated	Once with detailed designs documents	No marginal cost	HAWACO / DDSC	PMU

[3] *Project Management Unit under HAWACO; identified as Project Management Board (PMB) in IEE*
[4] *No marginal cost indicates that costs to implement mitigation are to be built into cost estimates of bids of contractors*
[5] *Detailed Design & Supervision Consultant*

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
EMP	Minimize negative environmental impacts	6. Include all mitigation measures and monitoring requirements of EMP where necessary to meet detailed designs. 7. Identify all potential impacts of project and include in EMP. 8. Submit EMP with all potential impacts to ADB to review. 9. For the 2 components of project, develop individual environmental management sub-plans for: **a)** Securing GoV approvals; **b)** UXO survey & removal; **c)** Forest clearing, tree/ vegetation removal, & site restoration; **d)** Civil works; **e)** Cultural chance finds; **f)** Contaminated spoil identification & disposal; **g)** Construction materials acquisition, transport, & storage including borrow pit management; **h)** Erosion & river sedimentation control; **i)** Construction site drainage; **j)** Noise, dust & NOx, SOx, CO, CO_2 emissions; **k)** Solid and liquid waste disposal; **l)** Hazardous chemical & waste management; **m)** Construction & urban traffic; **n)** Utility and Power Disruption; **o)** Worker and public Safety (especially along pipeline); **p)** water quantity & quality sustainability; **q)** Training & capacity development plan; **r)** BPS HClO management; and **s)** Treated water quality management along the pipeline.	Entire project	In parallel with completion of detailed designs	Once, as part of detailed design phase	No marginal cost	HAWACO / DDSC	PMU
Develop bid documents	No negative environmental impact	10. Ensure the EMP is included in contractor tender documents to enable contractors to develop their CEMP[6], and that tender documents specify that implementation of CEMP must be included in cost estimates. 11. The environmental management sub-plans identified in 11) above should be identified in the appropriate contractor tender documents, for the contractor to detail into CEMPs for their bidding documents.	All project areas	Before construc-tion begins	Once for all tenders	No marginal cost	HAWACO / DDSC	PMU / DDSC

[6] *Contractors Environmental Management Plan*

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		12. Specify in bid documents that contractor must have experience with implementing EMPs, and/or provide staff with EMP experience.						
UXO survey	Injured worker or public	13. Ensure military is consulted and clears areas where necessary.	All construction sites.	Before any clearing or excavation	Once	See Monitoring Plan below	City CPC & military	military
Training & capacity development	No negative environmental impact	14. Develop and schedule training plan for HAWACO / PMU staff to be able to fully implement EMP, and manage implementation of mitigation measures by contractors. 15. Create awareness and training plan for later delivery to contractors whom will implement mitigation measures.	For all project areas	Before construc-tion begins	After each training session	No marginal cost	DDSC	DDSC / HAWACO
Procurement of Contractor(s)	No negative environmental impact	16. Ensure winning contractor bid(s) include a CEMP that addresses items 8 – 11 of the EMP" section above.	All project areas	Before contracts signed	Once	No marginal cost	HAWACO / DDSC	HAWACO / DDSC
Recruitment of workers	Community mischief, & sexually transmitted disease	17. Use local workers as much as possible, reducing #s of migrant worker	For all work locations	Through-out construc-tion phase	After worker hiring stages	No marginal cost	HAWACO / DDSC	Contractor's bid documents
Construction Phase – General Mitigations for all Components of Project								
Initiate EMP & sub-plans,	Prevent or minimize impacts	18. Initiate the EMP including individual management sub-plans for the different types of potential impacts identified in pre-construction phase. See sub-plan implementation guidance below.	For all construction sites	Beginning of construc-tion	Once	No marginal cost	HAWACO / DDSC	PMU & contractors
Obtain & activate construction permits and licenses	Prevent or minimize impacts	19. Contractors to comply with all statutory requirements set out by DoNRE for use of construction equipment, hazardous waste & chemicals management, and operation of construction plants, e.g., concrete batching.	For all construction sites	Beginning of construc-tion	Once	No marginal cost	HAWACO / DDSC	PMU & contractors
Training & capacity	Prevention of impacts through education	20. Implement training and awareness plan for HAWACO / PMU (Environmental staff) and contractors.	PMU offices, construction sites	Beginning of construc-tion	After each event	No marginal cost	DDSC	DDSC & PMU
Tree and vegetation	Damage or loss of trees,	21. Restrict tree and vegetation removal to within designated RoWs.	All construction sites.	Beginning and end of	Monthly	No marginal cost	DDSC / PMU	contractor

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
removal, and site restoration sub-plan	vegetation, and erosion of landscape	22. Within RoWs minimize removals, and install protective physical barriers around trees that do not need to be removed. 23. All RoWs to be re-vegetated and landscaped after construction completed. Consult forestry department to determine the most successful restoration strategy and techniques. 24. Recuperate tree logs and make them available for local use.		project				
Civil works	Degradation of terrestrial resources	25. All construction sites should be located away forested, plantation, & agricultural areas as much as possible. 26. No unnecessary cutting of trees. 27. All construction fluids such as oils, and fuels should be stored and handled well away from forested, agricultural land and plantation areas. 28. No waste of any kind is to be discarded on land or in forests/plantations or in the trenches dug for the pipeline.	All construction sites	Through-out construc-tion phase	Monthly	No marginal cost	DDSC & PMU	contractor
Civil works	Degradation of water quality & aquatic resources	29. Excavation spoils from the BPS and reservoir excavation should be done so the excess water does no disperse into the irrigation canals nearby. 30. Erosion channels must be built around aggregate stockpile areas to contain rain-induced erosion. 31. Plastic tarps should be used to cover piles to avoid drying and erosion of the piles. 32. Earthworks should be conducted during dry periods when possible. 33. All construction fluids such as oils, and fuels should be stored and handled well away from surface waters. 34. No waste of any kind is to be thrown in surface waters. 35. No washing or repair of machinery near surface waters. 36. Pit latrines to be located well away from all	All construction sites	Through-out construc-tion phase	Monthly	No marginal cost	DDSC & PMU	contractor

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		surface waters. 37. No unnecessary earthworks in or adjacent to all water courses. 38. No aggregate mining from any brooks, river, or from nearby lakes. 39. All existing irrigation ditches, canals and channels to be protected the same way as rivers and lakes.						
Cultural chance finds	Damage to cultural property or values & chance finds	40. As per detailed designs, all civil works should be located away from all cultural property and values including cemeteries and pagodas when possible. 41. Precautionnary measures and specific communications to the manager/priest/monk in charge of the installations should be done prior to approaching those specific sites. 42. Chance finds of valued relics and cultural values should be anticipated by contractors. Site supervisors should be on the watch for finds. 43. Upon a chance find all work stops immediately, find left untouched, and PMU and CPC notified. If find deemed valuable, provincial cultural authorities must be notified. 44. Work at find site will remain stopped until authorities allow work to continue.	All construction sites	At the start, and throughout construc-tion phase	Monthly	No marginal cost	DDSC & PMU	contractor
Construction materials acquisition, transport, and storage sub-plan	Pollution, injury, increased traffic, disrupted access	45. All borrow pits and quarries should be approved by DoNRE. 46. Select pits and quarries in areas with low gradient and as close as possible to construction sites. 47. Required aggregate volumes must be carefully calculated prior to extraction to prevent wastage. 48. Pits and quarries should not be located near surface waters, forested areas, critical habitat for wildlife, or cultural property or values. 49. Although it should be avoided at all costs, if aggregate mining from fluvial environments is required small streams and rivers should be used, and dry alluvial plains preferred. 50. All topsoil and overburden removed should be	For all construction areas.	Through-out construc-tion phase	Monthly	No marginal cost	DDSC / PMU	Contractor(s)

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		stockpiled for later restoration. 51. All borrow pits and quarries should have a fence perimeter with signage to keep public away. 52. After use pits and quarries should be dewatered and permanent fences installed with signage to keep public out, and restored as much as possible using original non-organic overburden excavation spoils.[7] 53. Unstable slope conditions in/adjacent to the quarry or pit caused by the extractions should be rectified with tree planting. 54. Define & schedule how materials are extracted from borrow pits and rock quarries, transported, and handled & stored at sites. 55. Define and schedule how fabricated materials such as steel, wood structures and scaffolding will be transported and handled. 56. All aggregate loads on trucks must be covered. 57. Piles of aggregates at sites should be used/or removed promptly, or covered and placed in non-traffic areas.						
Excavation spoil management sub-plan	Contamination of land and surface waters from excavated spoil	58. Uncontaminated spoil to be disposed of in DoNRE-designated sites, which must never be in or adjacent surface waters. Designated sites must be clearly marked and identified. 59. Filling of sunken or low laying areas with clean spoils or surface soils should be done only if a sign authorization from the land manager is granted. Such authorization won't give the right not to respect the various measures listed in the EMP especially 70 to 75. 60. Spoil must not be disposed of on sloped land, near cultural property or values, ecologically important areas, or on/near any other culturally or ecologically sensitive features including wetlands	All excavation areas	Through-out construc-tion phase	Monthly	No marginal cost	DDSC, PMU & DoNRE	Contractor

[7] *Note : Organic matter buried at a certain depth preventing oxygen to infiltrate the soil will degrade while emitting methane which is 21 times stronger than carbon dioxide as a greenhouse gas*

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		such as swamps. 61. Where possible spoil should be used at other construction sites, or disposed in spent quarries or borrow pits. 62. A record of type, estimated volume, and source of disposed spoil must be recorded. 63. Contaminated spoil disposal must follow GoV regulations including handling, transport, treatment (if necessary), and disposal. 64. Suspected contaminated soil must be tested, and disposed of in designated sites identified by DoNRE as per GoV regulations. 65. Before treatment or disposal contaminated spoil must be covered with plastic and isolated from all human activity.				Testing of contamina-ted soil (See Monitoring Plan below)		DoNRE
Construction Drainage sub-plan	Flooding from loss of drainage & flood storage	66. Provide adequate short-term drainage away from construction sites to prevent ponding and flooding. 67. Manage to not allow borrow pits and quarries to fill with water. Pump periodically to land infiltration or nearby water courses. 68. Install temporary storm drains or ditches for construction sites. 69. Ensure existing road & street drains do not become plugged with construction waste[8] . 70. Protect surface waters from silt and eroded soil.	All areas with surface waters	Design & construc-tion phases	Monthly	No marginal cost	DDSC & PMU	contractor
Solid and liquid construction waste sub-	Contamina-tion of land and surface waters from	71. Management of general solid and liquid residual matter of construction will follow GoV regulations, and will cover, collection, handling, transport, recycling, and disposal of waste created from construction activities and workforce. 72. Areas of disposal of solid and liquid residual matter to be determined by DoNRE. 73. Disposed of residual matter should be catalogued for type, estimated weight, and source.	All construction sites	Through-out construc-	Monthly	No marginal cost	DDSC, PMU, & DoNRE	contractor

[8] *Waste: A WASTE is the end product which can't be recycled, reused or transformed and needs to be sent to a landfill or a furnace. The term RESIDUAL MATTER fits best where recycling material are either collected separately from the wastes or when they are gathered with the actual wastes.*

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
plan	construction waste	74. Construction sites should have large garbage bins. 75. A schedule of solid and liquid residual matter pickup and disposal must be established and followed that ensures construction sites are as clean as possible. 76. Solid residual matters should be separated and recyclables sold to buyers in community. <u>Hazardous Waste</u> 77. Collection, storage, transport, and disposal of hazardous waste such as used oils, gasoline, paint, and other toxics must follow GoV regulations. 78. Wastes should be separated (e.g., hydrocarbons, batteries, paints, organic solvents) 79. Wastes must be stored above ground in closed, well labeled, ventilated plastic bins in good condition well away from construction activity areas, all surface water, water supplies, and cultural and ecological sensitive receptors. 80. All spills must be cleaned up completely with all contaminated soil removed and handled with by contaminated spoil sub-plan. 81. During construction, a prevention kit consisting of heavy weight oil only absorbent and / or cat litter should be available to prevent infiltrations much as possible.		tion phase				
Noise and dust sub-plan	Dust Noise	82. Regularly apply wetting agents to exposed soil and construction roads especially in high density areas. 83. Cover or keep moist all stockpiles of construction aggregates, and all truckloads of aggregates. 84. Minimize time that excavations and exposed soil are left open/exposed. Backfill ASAP. 85. As much as possible restrict working time between 07:00 and 17:00. In particular are activities such as pile driving. 86. Maintain equipment in proper working order.	All construction sites.	Fulltime	Monthly	No marginal cost	DDSC & PMU	contractor

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		87. Replace unnecessarily noisy vehicles and machinery. 88. Vehicles and machinery to be turned off when not in use. 89. Construct temporary noise barriers around excessively noisy activity areas where possible and if the impacts of constructing such a barrier is lesser then the noise impact itself.						
Utility and power disruption sub-plan	Loss or disruption of utilities and services such as water supply and electricity	90. Develop carefully a plan of days and locations where outages in utilities and services will occur, or are expected. 91. Contact local utilities and services with schedule, and identify possible contingency back-up plans for outages. 92. Contact affected community to inform them of planned outages. 93. Try to schedule all outages during low use time such between 24:00 and 06:00.	All construction sites.	Fulltime	Monthly	No marginal cost	DDSC, PMU & Utility company	contractor
Erosion sub-plan	Land erosion	94. Berms, and plastic sheet fencing should be placed around all excavations and earthwork areas. 95. Earthworks should be conducted during dry periods. 96. Maintain a stockpile of topsoil for immediate site restoration following backfilling. 97. Protect exposed or cut slopes with planted vegetation, and have a slope stabilization protocol ready. 98. Re-vegetate all soil exposure areas ASAP.	All construction sites	Through-out construc-tion phase	Monthly	No marginal cost	DDSC & PMU	contractor
		99. Proper fencing, protective barriers, and buffer zones should be provided around all construction sites. 100. Sufficient signage and information disclosure, and site supervisors and night guards should be placed at all sites. 101. Worker and public safety guidelines published by MoLISA should be followed.						

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Worker and public safety sub-plan	Public and worker injury, and health	102. Speed limits should be imposed on all roads used by construction vehicles. 103. Standing water suitable for disease vector breeding should be filled in. 104. Worker education and awareness seminars for construction hazards should be given. A construction site safety program should be developed and distributed to the workers. 105. Appropriate safety clothing and footwear should be mandatory for all construction workers. 106. Adequate medical services must be on site or nearby all construction sites. 107. Drinking water must be provided at all construction sites. 108. Sufficient lighting to be used during necessary night work. 109. All construction sites should be examined daily to ensure unsafe conditions are removed.	All construction sites.	Fulltime	Monthly	No marginal cost	DDSC & PMU	contractor
Construction and local vehicle traffic sub-plan	Traffic disruption, traffic block, accidents, public injury	110. Schedule construction vehicle activity during light traffic periods. Create adequate traffic detours, and sufficient signage & warning lights at all construction locations. 111. Post speed limits, and create dedicated construction vehicle roads or lanes. 112. Inform community of location of construction traffic areas, and provide them with directions on how to best co-exist with construction vehicles on their roads. 113. Increase the number of pedestrian crossings away from construction areas. 114. Increase road and walkway lighting. 115. Organize the dump trucks travelling to avoid as much as possible the circulation of empty loads on the roads. 116. Provide alternate routes and / or work planned locations to help emergency response units to plan their alternate routes.	All construction sites	Fulltime	Monthly Weekly	No marginal cost	DDSC & PMU	contractor

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
Specific Mitigations for the BPS installation in Son Tay								
Construction of BPS	Minimal negative environment-tal impacts	117. Mitigation measures to address potential impacts of BPS all addressed by the general project mitigations listed above.	Land around BPS site	During construc-tion	Monthly	No marginal cost	DDSC / PMU	contractor
Excavation and earthwork of the BPS	Minimal negative environment-tal impacts	Specific attention to be given to the protection of the following values: 118. a) Provide respectfull service and compensations to the family that will have to displace the graves of their family menbers b) erosion and spillage of spoils through nearby drainage canals; b) public & worker safety.	Land around BPS site	During construc-tion	Monthly	No marginal cost	DDSC / PMU	contractor
Specific Mitigations for Construction of Clean Water Supply Pipeline								
Construction of pipeline	Minimal negative environment-tal impacts	119. Special attention to be given to sub-plans identified item #8 and 107 to 109. Specific attention to be given to the protection of the following values: a) Public & worker safety; and b) traffic and community/ commercial disruption.	Pipeline corridor	During construc-tion	Monthly	No marginal cost	DDSC / PMU	contractor
Post-construction Operation of BPS and distribution grid								
Treated water supply	Unsustaina-ble quantity or quality of treated water	120. Develop and implement O&M manual for all equipment and operations of the chlorine and BPS pumpswhich includes regular maintenance and materials supply to ensure a steady clean water production (m^3/day) that meets VINACONEX WTP design specifications. Incorporate contingency and back-up plans for planned and unplanned system shutdowns. 121. Establish a regular treated water quality monitoring program to ensure the quality of treated water meets original Da River WTP design specifications. Incorporate contingency and response plans to address episodes of decreased treated water quality, including public notification. (See Environmental Monitoring Plan below). 122. Establish a daily, reliable and specific diary for the communication made with VINACONEX in wich topic of discussion on water treatment quality and water disponibility should be	Entire WS system At BPS outlet and at select locations along distribution network	Quarterly, and as needed	As needed	No marginal cost	HAWACO / DDSC	HAWACO TREC / DoH

Project Activity	Potential Impact	Proposed Mitigation Measure	Location	Timing	Reporting	Estimated Cost (USD)	Responsibility	
							Supervision	Implementation
		described. 123. As part of #131 coordinate with VINACONEX and the Dept of Health for them to periodically monitor treated water quality to ensure it meets potable quality standards.						
Operation of treated water pipelines	Local flooding from ruptures	124. As part of implementation of O&M manual for entire WS system instate a regular inspection program of all pipeline networks starting at arrival at the BPS, the water entering the reservoir, exiting the reservoir and then to entire distribution network with focus on junctions and end-user connections.	At all pipeline locations.	Quarterly, and as needed	As needed	No marginal cost	HAWACO / DDSC	HAWACO
Operation of BPS	Chemical spills, and pollution from solid and domestic waste	125. As part of O&M manual provide clear methods and procedures for safe handling and storage of HClO in the chlorine warehouse on BPS property, including spill action plan. 126. With O&M manual define and implement a formal solid and domestic waste collection and disposal protocol for all BPS activities.	At BPS	Continuou-sly	As needed	No marginal cost	HAWACO	HAWACO

D. Environmental monitoring program

264. It is essential to design the monitoring program and monitoring frequency appropriately to be able to record both the overall performance of the project works as well as the short-term impacts due to construction activities. The environmental monitoring program will be implemented during construction at three levels:

- Monitoring the level of compliance with mitigation measures,
- Community-based Monitoring, and
- Monitoring the environmental parameters set out in the IEE report for each of the works.

a. Objective and Approach

265. Main objective of the Environment Monitoring program is to ensure that (a) the potential negative impacts of the project are minimized; (b) the EMP is impactively implemented; and (c) the EMP is adequate to mitigate the potential negative impacts. Given that monitoring the implementation of the RP will be conducted separately, the environmental monitoring program will comprise (a) monitoring the safeguard performance of Contractor during site clearance and construction, (b) environmental quality monitoring, (c) monitoring impactiveness of the EMP.

b. Monitoring on Contractor's Environmental Safeguard Performance

266. Three levels of safeguard monitoring will be implemented: routine monitoring, periodic monitoring, and community monitoring as follows:

- Routine monitoring: The routine monitoring will be made by the Construction Supervision Consultant (CSC) as assigned by PMU. The CSC will include the monitoring results in the project progress reports.
- Periodic monitoring (every six months): As part of the overall monitoring of the EMP, the ESU assisted by the Independent Environmental Monitoring Consultant (IEMC) will also monitor Contractor performance every 6 months and the results will be reported to the PMU and ADB.
- Community monitoring: Monitoring by local communities will be conducted following the Government practices with the technical and management support from the PMU.

c. Environmental Quality Monitoring

267. To ensure an acceptable level of environmental quality, monitoring of dust, noise, vibration, air quality, and water quality will be made at project specific locations that are likely to be significantly affected by the construction activities, or requested by local authorities and communities for specific purposes. ESU/IEMC will be responsible for the monitoring of the program.

268. Below is the list of main problems and scope of environmental monitoring that will be taken into account in environmental monitoring program:

- Impacts of construction activities on quality of surface water in Nui Coc Lake
- General construction impacts, including local flooding; traffic management especially in residential areas; air, noise, and dust levels in residential areas; and water quality upstream and downstream of construction sites, specifically paying attention for impacts on local residents;

- Others: as agreed with local agencies and communities during the preparation of the monitoring program.

269. The following tables provide general guidance on the monitoring program and its estimated cost for the project at different stage: pre-construction (project baseline environment), during construction (proposed to be from 3/2012-6/2016), and during the first year of operation.

Table 33 Environmental monitoring Plan

Environmental Indicators	Location	Means of Monitoring	Frequency	Reporting	Responsibility		Estimated[9] Cost (USD)
					Supervision	Responsibility	
Pre-construction Phase – Update Baseline Conditions							
Air quality (dust, CO, NOx, SOx, noise, wind, and vibration levels) to supplement baseline air quality data collected during PPTA and reported in IEE Water quality parameters sampled during PPTA & reported in IEE.	Representative sites of heavy civil & earthwork including along truck routes At BPS station	Using field and analytical methods described in QCVN and TCVN standards for ambient air and surface water quality sampling & analysis.	One day and one night measurement	One baseline supplement report before construction phase starts	DDSC & PMU	Environmental monitoring company	tbd. tbd
Presence of UXO	Potentially located throughout project area	Military to survey and sweep affected areas of UXO	Once	Once	HAWACO	military	$100-150,000
Construction of Son Tay BPS and Clean Water Distribution Pipeline and Network							
A) Air quality: dust, CO, NOx, SOx, noise, wind, and vibration levels **B)** Surface water quality: TSS, heavy metals (As, Cd, Pb,) oil and grease, total & faecal coliform, pH, DO, COD, BOD_5, temperature, NH_3, and other nutrient forms of N & P.	A – B): At water quality sites #1 - #4 sampled during PPTA and reported in IEE	A – B : Using field and analytical methods described in QCVN and TCVN standards for ambient air and surface water quality monitoring. Include visual observations of dust and noise from contractor & public reports .	(A – B): Quarterly during construction periods	Quarterly	DDSC / PMU	Environmental monitoring company	A) & B) Tbd under ADB loan
C) Public comments and complaints	C): Using hotline number placed at construction areas	C) Information transferred by telephone hotline number	C) Continuous public input		PPC / HAWACO	PMU / contractor	C) & D) With (no marginal cost)
D) Incidence of worker or public accident or injury	D): At all construction areas	D) regular reporting by contractors/PMU	D) Continuous				
Perception survey and follow-up consultations with local residents	Residents near and along the main components;	HH survey	3 times per year during construction	Quarterly	HAWACO	Environmental monitoring company	Tbd under ADB loan
Operation of WTP & Pipeline Network							

[9] Estimated costs to be updated at detailed design stage

Environmental Indicators	Location	Means of Monitoring	Frequency	Reporting	Responsibility		Estimated[9] Cost (USD)
					Supervision	Responsibility	
Air quality: dust, noise and vibration levels	At BPS	Using field and analytical methods described in QCVN & TCVN standards for ambient air quality monitoring.	Quarterly for 5 years	Biannual	Environmental monitoring company		Tbd under ADB loan
Worker & public injury associated with BPS & pipeline network	On property of BPS, pipelines, and pump stations	Regular record keeping	Continuously	For each event	HAWACO		No marginal cost
Treated water quality: total & faecal coliform, pH, DO, NH_3, NO_3, NO, chlorine, PAC, NaCl, and heavy metals (As, Cd, Pb,).	At BPS & random user locations along distribution network	Using field and analytical methods described in QCVN & TCVN standards for water quality monitoring, and parameters of QCVN 14:2008/BTNMT & TCXDVN 33:2008/BXD	Biannually, or when public complaint arises	For each event	DoNRE (EPA)		Under EPA regular budget
Public complaints of operation of BPS, drinking water availability & quality, and malfunctions with pipelines (e.g., leaks).	At all sites	Regular record keeping	Continuously	Biannually	HAWACO		No marginal cost

270. The tables below estimate total numbers of water and air samples to be taken and analyzed (including cost) for project's environmental monitoring program during preconstruction and construction.

Table 34 Basic cost for chemical analyses

Order	Parameter	Price in Vietnamese currency (VNĐ)
I	*Air sample*	
1	TSP	300,000
2	CO	300,000
3	NO2	300,000
4	SO2	300,000
5	HC	600,000
6	Noise	100,000
Total		1,900,000
II	*Water/Surface water sample*	
1	Temperature	20,000
2	pH	40,000
3	DO	70,000
4	TSS	70,000
5	BOD5	120,000
6	COD	120,000
7	Oil and grease	350,000
8	Coliform	120,000
Total		910,000

Table 35 Estimated cost for samples collection and analysis

No	Content	Unit	Quantity	Price (VND)	Total (VND)	Total USD)
1	Water sample	Sample	72	910,000	65,520,000	3120
2	Air sample	Sample	72	1,900,000	136,800,000	6514.3
3	Others			24,000,000	24,000,000	1140
Summation					**226,250,000**	**10,774**

d. Monitoring Effectiveness of the EMP

271. The ESU assisted by IEMC will monitor performance of the EMP implementation during the detailed design/bidding stage as well as during construction and first year operation of the facilities to ensure that (1) the impacts identified in the EMP will be impactively managed and mitigated;; (2) traffic management is adequate and the level of impacts are acceptable (no complaints or outstanding cases). Results/are to be properly kept in the project file for possible review by PMU and ADB. Cost for the monitoring will be part of the PMU cost.

E. Role and Responsibilities for EMP Implementation

a. Organization Arrangement

272. Figure and Table below summarize roles and responsibilities of the key parties and their relationships regarding the implementation of the EMP.

- Contractors are responsible for implementing mitigation measures. Measures will be included in bidding documents and costs are to be included in construction bids;
- CSC is responsible for monitoring the day-to-day implementation of mitigation measures. Cost included in CSC service contract;

273. IEMC will be responsible for environmental monitoring which includes support to the PMU for implementing supervision and monitoring, and reporting on the implementation through monitoring reports

Figure 9 Organization Diagram for the EMP Implementation

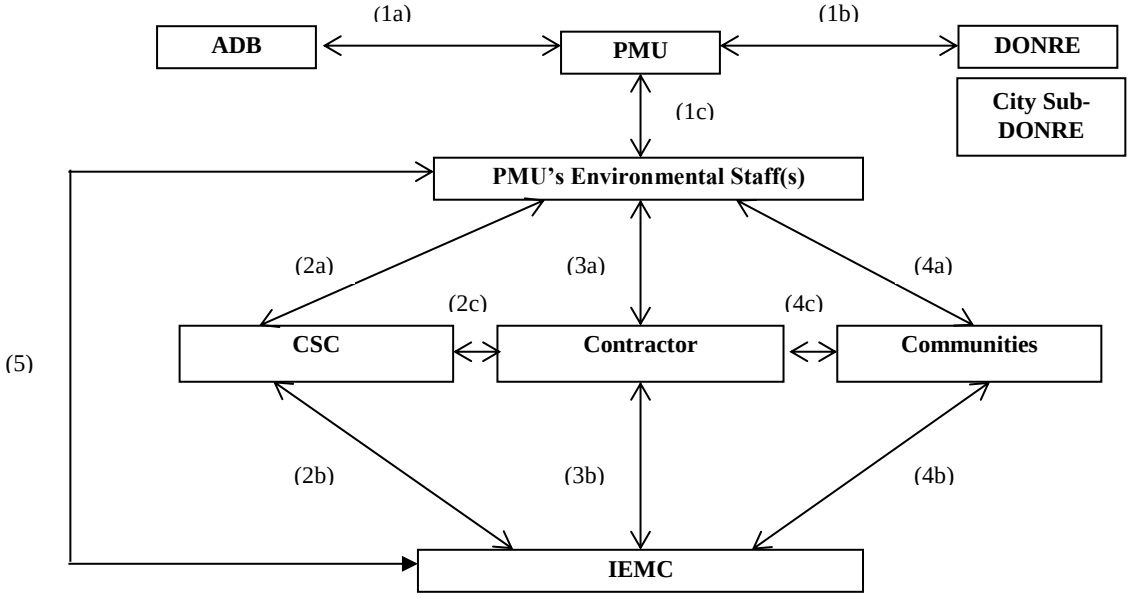


Table 36 Roles and responsibilities of key parties (Description for the above Figure)

Description	Roles/Responsibilities
(1a) (1b)	Based on quarterly reports of IEMC, PMU is responsible for preparing periodic reports to submit to ADB and to the Provincial DONRE.
(1c)	PMU assigns the safeguard staff (ESU) to review and check the related sections in the Contract Documents on the bidding packages for construction items of the project to ensure compliance with EMP PMU assigns the safeguard staff (ESU) to supervise, manage and carry out EMP activities and also assigns CSC to closely supervise/monitor safeguard performance of Contractor, including undertaking the environmental monitoring program. PMU/ESU establishes a hotline communication with local community to be responsive to the complaints, comments, and/or recommendations from local people and/or the public throughout the site clearance and construction period.

Description	Roles/Responsibilities
(2a)	CSC submits periodic monitoring report of environmental mitigation measures to PMU; Recommends to the PMU to suspend in part or completely, construction works if it does not meet labor safety and environmental protection requirements of the contract. PMU reviews CSC's periodical reports to ensure compliance with mitigation measures.
(2b)	CSC: Support, collaborate with IEMC to establish, collect and point out information about essential environmental parameters in the field and information for construction implementation; IEMC: Monitor the implementation of the EMP every 3 months including submission of the field report. Create database of results from environmental supervision and monitoring and train PMU in using such database Coordinate with CSC on monitoring and preparation of safeguard reports on EMP performance; enhance capacity for CSC through a training program on environmental supervision
(3a)	Contractor: Before construction, with assistance from IEMC, prepare a site-specific environment management plan (SEMP) during site clearance and construction process as part of their construction method statement, then submit it to CSC and/or PMU for review and approval; During construction, Contractor has to submit a monthly report on safeguard issues, mitigation, and results throughout the construction period. In case of unexpected problem, Contractor will consult CSC/PMU. PMU/CSC: reviews the SEMP and can propose change as deemed necessary to be in line with the legal obligations as well as appropriate to each specific site. Daily supervision and monitoring of Contractor's safeguard performance will be responsibility of the CSC.
(3b)	Contractor: Carry out the EMP required during site clearance and construction, including conduct self-monitoring and submission of report. IEMC: periodically supervise and monitor the overall project EMP implementation including provision of safeguard training to PMU/ESU staff, community, CSC, and Contractors as needed. The training will be designed to enhance the impactiveness of the EMP implementation and reporting.
(4a)	Community: According to Vietnamese practice, the community has the right and responsibility to routinely monitor environmental performance during construction to ensure that their rights and safety are adequately protected and that the mitigation measures are impactively implemented by Contractors and/or PMU. In case of unexpected problems, they will report to CSC/PMU and/or call the hotline. PMU: Encourage, support and create good conditions for local community to participate in the environmental supervision and monitoring activities. PMU/CSC will review and response to the requests and/or recommendations made by community to ensure that the potential negative impacts are adequately mitigated.

Description	Roles/Responsibilities
(4b)	Community: Support and collaborate with IEMC during periodic monitoring and provide inputs to the overall safeguard issues that require attention and/or mitigation. IEMC: Strengthen local community's capacity and relevant agencies through preparation of relevant documents necessary for monitoring, supervision, and reporting including preparation of a database for the activities. IEMC: assist PMU and communities for the implementation of Information-Education-Communication (IEC) activities within Component 4 with regard to environmental hygiene, sanitation, road safety, etc.
(5)	IEMC supports PMU/ESU to implement the EMP in line with Government's environmental regulations as well as the ADB safeguard policies. In consultation with DONRE, IEMC will establish specific environmental monitoring program for the project to be implemented by CSC at key locations as shown in detailed design documents. PMU is responsible for preparation of the 6-month progress reports to be submitted to ADB and DONRE, based on quarterly reports submitted by IEMC.

b. Specific Responsibilities of PMU, CSC, and IEMC

274. Project Management Unit (PMU):

- PMU is responsible for implementing the EMP during the detailed design and construction stages. EMP implementation during operation stage is the responsibility of the facilities operators. PMU will set up an Environmental and Social Unit (ESU) to ensure timely and impactive implementation of the EMP, including preparation of reports on safeguard compliance as required by Government and ADB.
- PMU/ESU is responsible for ensuring that the related sections in the Contract Documents on the bidding packages for construction items of the project are in compliance with the EMP.
- PMU/ESU is responsible for communicating with relevant local, provincial and national departments; and with parties responsible for implementing and supervising EMP, especially with the provincial Department of Natural Resources and Environment (DONRE) and the concerned wards/communes during planning, monitoring, operation, and management.
- PMU/ESU will coordinate with community organizations to encourage them to actively participate in the planning, management, and implementation of the project, including monitoring of Contractor's performance.
- To ensure impactive monitoring and timely implementation of the EMP, PMU/ESU will hire national environmental Consultant to assist in carrying out and monitoring the EMP implementation. Responsibilities of the Independent Environmental Monitoring Consultant (IEMC) will be described below.
- For supervision and monitoring of Contractor's performance, PMU will be responsible for: (a) Checking project implementation indicators relating to environment; (b) Unannounced inspections to ensure that mitigation measures are being implemented as presented in construction contract by Contractor; (c) Reviewing periodic report of construction supervision consultant (CSC) to ensure

compliance with mitigation measures; and (d) Based on the periodic reports by CSC and IEMC, PMU will prepare report on environmental compliance of project to submit to ADB and DONRE (This is part of the submission of a 6-month progress report to ADB).

- PMU will coordinate closely with relevant enterprises on water supply, environmental sanitation, solid waste collection and to monitor operation and maintenance during project implementation.

c. Independent Environmental Monitoring Consultant (IEMC)

275. The IEMC will be responsible for assisting the PMU in EMP implementation. This also includes advising the CSC, Contractors and communities on environmental compliance, and carrying out the monitoring program in accordance with regulations and procedures of the Government and ADB. Once the detailed operational implementation of the environmental monitoring program is discussed by PMU and ADB, the IEMC will be responsible for quarterly checking, and supporting the PMU staff to supervise overall project activities to ensure that unified environmental protection policies of the Government and ADB are applied and supervised during project implementation. The IEMC will be responsible to: (1) provide training and capacity building for construction management for PMU/ESU staff, including field engineers and/or Consultant (CSC) in supervising the EMP implementation of Contractor; (2) ensure active participation of the local communities and schools in the project areas, (3) monitor environmental parameters to assess the overall impacts of the project, and (4) establish environmental training program.

276. Specifically, the IEMC's responsibilities include:

- Ensuring that the approved EMP and all project loan agreements related to environmental safeguards are fully applied and complied during project implementation.
- Assessing the impactiveness of mitigation measures which are provided by Contractor and CSC in implementation process; providing proposals and recommendations to the PMU on necessary improvement and supplementation to meet the safeguard requirements.
- Reporting periodically (every 3 months) to the PMU on actual EMP performance during project implementation.
- Establishing standard procedures, methods and forms to assist the PMU and CSC to assess Contractors' progress in implementing required impact mitigation and monitoring measures.
- Assisting the PMU's environmental staff to review and check the related sections in the Contract Documents on the bidding packages for construction items of the project to ensure compliance with environmental protection policies and impact mitigation and monitoring requirements.
- Measuring, taking samples and monitoring periodically environmental parameters (once per 3 months) during the time of environmental monitoring contract.
- Assistance in the preparation of documents and implementation of training program on environmental monitoring and supervision for Contractors, CSC and relevant staffs of PMU (environmental staffs and coordinators of packages).

- Via PMU, discussing with relevant enterprises (if necessary) to find suitable solutions for unexpected risks relating to environmental sanitation.

d. Construction Supervision Consultant (CSC)

277. The CSC is responsible for monitoring the safeguard performance of Contractor during site clearance and construction, including oversight of the self monitoring to be conducted by Contractor. With regard to safeguards, the CSC's main responsibility will include, but not be limited to, the following:

- Assist IEMC to establish, collect and provide information about both essential environmental indicators on-site and construction work.
- Ensure that construction work complies with approved EMP, relevant indicators and standardized operation in documents for environmental impact mitigation and monitoring.
- Monitor the mitigation measure implementation of Contractor, propose and deploy supplementary measures in time to complete mitigation measures and to meet the environmental management safety requirements of project.
- Make action plans/urgent solutions to cope with environmental problems, urgent situation and damages happening in construction
- Recommend PMU to suspend partially or completely construction work if labor safety and environmental protection requirements of the contract are not complied with.
- Organize regularly discussions with relevant enterprises and other stakeholders to provide information about implementation plans and necessary working program to enhance people's awareness of environmental protection during construction process.

e. Construction Contractor

- The construction Contractor's responsibilities in respects of all aspects of the works, including the environmental aspects, are set out in the contract between it and the PMU.
- Construction Contractors have their own responsibilities for both carrying out environmental impact mitigation measures and compliance with approved EMP during assembling construction of project packages. In the preparation of technical method statement, Contractor will study the project's approved IEE report and propose a construction method that includes environmental mitigation and protection measures that are aligned with the recommendations of the approved EMP.
- Contractor's method statement will be submitted to PMU and CSC for review, as well as to IEMC as deemed necessary. Changes, if there are any, will be evaluated for feasibility and for legal issues (laws, decrees, circulars and other regulations) before suitable adjustments are approved for specific cases on-site.
- During construction work, construction Contractor will be closely supervised by PMU, CSC, IEMC, environmental authorities and local community on EMP observation.

f. Reporting

278. PMU will prepare reports twice per year for submission to the ADB including the compliance with the EMP.

279. The report will contain the monitoring results and assessments of the EMC that show project progress and the status of implementation of the EMP. The reports will cover, among other matters as appropriate, the following:

- Contractor's compliance with mitigation measures
- Wastewater and environmental sanitation issues
- Existing flood situation where relevant
- Potential project-related risks and risk management issues

280. The report needs also to summerize results of status of measures to aid PAHs at new resettlement area.

F. Plan for Strengthening Capacity in the Environmental Supervision and Management

281. Collaboration between PMU and EMC is needed to organize training courses to strengthen knowledge and experiences in environmental supervision and management. In TOR of EMC, detailed plan and training documents for relevant objects in environmental supervision and management need to be included. These documents are prepared in the early stage and then approved by PMU and ADB.

282. Participants in these training courses are coordinators of project bidding packages, environmental & social unit's staff (ESU) of PMU, CSC, Contractors, local authorities and community representatives in the project area.

283. The schedule and content of each course will be discussed with PMU depending on scale, level and project progress.

Table 37 Training program for environmental capacity building

I. Objects	PROJECT MANAGEMENT UNIT
Training course	Environmental supervision, monitoring and reporting
Participators	Environmental staff and technical staff
Training Frequency	Soon after the project is impactive and will be updated based on requirements
Time	1 day presentation (yearly basis, until year one of implementation)
Content	General environmental management relating to project including requirements of ADB, DONRE, cooperating with relevant agencies Environmental supervision for the project include: • Requirements on environmental supervision • Supervision and implementation of mitigation measures; • Community participation in environmental supervision; Guide and supervise Contractor, CSC and community representatives in implementation of environmental supervision.

	• Forms used in environmental supervision; • Risk response and control; • Receiving approach and submit forms. • Other areas to be determined;
Responsibilities	PMU and IEMC.
II. Objects	**CSC, CONTRACTOR, COMMUNE/WARDS AUTHORITIES, COMMUNITY REPRESENTATIVES**
Training course	Implementation of mitigation measures
Participators	CSC; on-site construction management staff; environmental staff of Contractor; commune/ward/group authorities.
Training frequency	After bidding, update based on requirements
Time	1 day presentation (yearly basis, until year one of operation)
Content	Overview of environmental monitoring; Requirements of environmental monitoring; Role and responsibilities of Contractors and CSC Content and methods of environmental monitoring; Response and risk control; Propagate monitoring forms and guide how to fill in the forms and risk report; Other areas to be determined; Preparation and submission of report.
Responsibilities	PMU and IEMC
III. Objects	**COMMUNITIES AND WORKERS**
Training course	Environmental sanitation and safety
Participators	Representatives of community and/or worker leaders (as appropriate)
Training frequency	Soon after the project is impactive and will be updated based on requirements
Time	One-day presentation and one-day on-the job training (yearly basis)
Content	Preliminary presentation on environmental protection and environmental overview Key issues that require community and workers attention to minimize safety risks (roads, waterways, equipment, machines, etc.) as well as reduce pollution (dust, fume gases, oil/grease spill, waste management, etc.) Management of environmental safety and sanitation in work sites; Mitigation measures at construction site; Safety measures on electricity, mechanical, transportation, air pollution; Other areas to be determined; Procedures to deal with emergency situation.
Responsibilities	**Contractors, PMU with support from IEMC**

G. Estimated EMP Cost

Table 38 Estimated cost for hiring Environmental Monitoring Consultant (EMC)

No.	Content	Unit	Quantity	Price (VND)	Total (VND)	Total (USD)
1	Specialist salary	Month	7	30,680,000	214,760,000	10,226.6
2	Local stays and allowance	Day	48	520,000	24,960,000	1188.6
3	Traveling expenses	Turn-person	48	832,000	39,936,000	1901.7
4	Training course	Overall	6	5,720,000	34,320,000	1634.3
5	Office supply	Overall	24	6,240,000	149,760,000	7131.4
6	Office and communication	Overall	24	4,992,000	119,808,000	5705.1
	Total				**583,544,000**	**27,788**

IX. CONCLUSIONS, SUGGESTIONS AND COMMITMENTS

A. Conclusions

284. From the results of preparing the IEE report for the investment project on "development of the water supply system along Lang - Hoa Lac road axis (in Hanoi's territory) using Da River's water source", some conclusions can be drawn as follows:

- On the goal of the project: the project if implemented will be sure to achieve all objectives set.
- Regarding the water supply scope of the project: water supply scope set for districts of Hoai Duc, Quoc Oai and Thach That is reasonable. These districts are populated rural areas currently lacking clean water. Besides serving these adjacent rural areas, the construction of the water supply system also meets the demand for clean water in other important urban and industrial zones of Hanoi.
- Regarding socio-economic efficiency: the project to be implemented will provide stability in the supply of clean water at a reasonable price. Living conditions of the local people will be raised. Environmental sanitation will be improved. The project will also create favorable conditions for development of local economy in the project area in particular and of Hanoi's economy in general. In addition, the project will help the Vinaconnex Water Supply JSC (VIWASUPCO) to fund throught revenues and plan the sustainable development of the Da River's WTP as a guarantee on water security for Hanoi.
- On environmental impacts: the project will not cause local negative lagging impacts. In the preparation phase, construction phase and the operational phase, the project may cause some negative impacts, but at small extents, such as dust pollution, noise pollution, pollution from rainwater runoff containing high concentrations of suspended solids, pollution by wastes of workers during construction, construction waste and a risk of occupational safety, of transportation and of chemicals. However, with the construction method of "successive construction" and "divided into areas", number of workers as well as mobilized machinery is not large, so the project's impact on the environment will be only localized, temporary, and can be mitigated. A certain attention will need to be observe concerning the wastewater increase following the implementation of the project and the capacity to treat this increase in order to reduce and avoid impacts to downstreams communities.
- The project complies with Master Plan on Construction of Hanoi to 2030 with a vision up to 2050 that was approved by the Prime Minister in Decision No. 1259/QD-TTg on 26/07/2011 and Master Plan on Water Supply of Hanoi to 2030, with a vision up to 2050 (submitted and waiting for approval of the Prime Minister).

B. Suggestions

285. This is a project with significant economic and social benefits and small negative environmental impacts that are temporary and can be mitigated. It is therefore suggested to kindly request Hanoi City People's Committee to approve the Feasibility Study Report and Environmental Impact Assessment Report as early as possible. This will serve as a legal basis for the project to be continued with deployment and to be soon put into operation.

C. Commitments

286. Project Owner-HAWACO is committed to:

- Comply with the Law on Water Resources No. 17/2012/QH13 dated 21/6/2012 by the National Assembly of the Socialist Republic of Vietnam.
- Comply with Law on Construction No.16/2003/QH11 dated 26/11/2003 of the National Assembly of the Socialist Republic of Vietnam.
- Comply with the Law on Environmental Protection No.52/2005/QH11 dated 29/11/2005 of National Assembly of the Socialist Republic of Vietnam.
- Comply with the Law on Land No.13/2003/QH11 dated 26/11/2003 of the National Assembly of the Socialist Republic of Vietnam.
- Comply with current decrees, circulars and other legal documents related to the activities of the project.
- Strictly implement measures to control sources of pollution arising from the activities of the project according to the technical plan outlined in the IEE Report.
- Perform a full range of measures to minimize the negative impacts arising in the stage of preparation, construction and operation of the project as described in this IEE Report
- In case of accident, risk and environmental pollution affecting the surrounding areas, we commit ourselves to fix and restore the environment in accordance with the law.
- During operation of the project if any environmental problem arises, we will immediately report to the local environmental authorities and agencies having expertise to promptly prevent and handle;
- Ensure adequate funding to carry out environmental monitoring programs annually.
- Comply with regulations on environmental quality set in the national technical regulations such as: QCVN 26:2010 / MONRE - National technical regulation on noise; QCVN 27:2010 / MONRE - National technical regulation on vibration; QCVN 05:2009 / MONRE - National Technical Regulation on ambient air quality; QCVN 01:2009 / BYT - National Technical Regulation on drinking water quality; QCVN 08 : 2008/BTNMT - National Technical Regulation on surface water quality; QCVN 09:2008 / MONRE - National Technical Regulation on groundwater quality; QCVN 14:20008 / BTNMT - National Technical Regulation on domestic wastewater.
- Archive, update and publicize information on the project's environmental data.

287. For purposes of compliance with ADB environmental assessment guidelines, no additional study or full environmental impact assessment is needed to further assess the potential environment impacts of the project.

X. REFERENCES

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2. Statistical Yearbook of Hanoi in 2011
3. National Techical Regulations and Technical Standards of Viet Nam
4. Vietnam's Law on Environmntal Protection, Political Publishing House 2005

B. In English

1. Rapid Environmental Assessment, WHO, 1993
2. Department of Transportation – United States of America. 2006. Transit Noise and Vibration Impact Assessment