PEOPLE COMMITTEE OF DA NANG CITY
DA NANG DEPARTMENT OF TRANSPORT
DANANG PRIORITY INFRASTRUCTURE INVESTMENT PROJECT MANAGEMENT UNIT

SFG2442

ENVIRONMENTAL IMPACT REPORT

Component 3 – Urban Strategic Roads

Works "*Improvement and upgrading of the road DH2 (Hoa Nhon – Hoa Son)*"

Public Disclosure Authorized

December - 2015

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PROJECT OWNER **CONSULTING FIRM**

December – 2015

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ABBREVIATIONS

AHs	Affected households
CC	Climate change
AC	Asphalt concrete
CeC	Cement concrete
CSC	Construction Supervision Consultant
DED	Detailed engineering designer
DOC	Department of Construction
DOF	Department of Finance
DONRE	Department of Natural Resources and Environment
DOT	Department of Transport
DPI	Department of Planning and Investment
SCDP	Sustainable City Development Project
EIA	Environmental impact assessment
ECOP	Environmental Code of Practice
EMC	Environmental Monitoring Consultant
EMP	Environmental Management Plan
EMS	Environmental Monitoring System
FS	Feasibility Study
ODA	Official Development Assistance
PMU	Project Management Unit
PSC	Project Steering Committee
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
TDC	Resettlement
PPC	Provincial/city People's Committee
URENCO	Urban Environment Company
WB	World Bank

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INTRODUCTION

1. Background

Danang Sustainable City Development Project, a multi-sectoral project has the overall goal of promoting socio-economic development of Danang city, improving urban utilities, enhancing living conditions, implementing poverty reduction for the city residents, meeting travel demand, preventing traffic congestion, reducing pollution, preventing floods and increasing the capacity against natural disasters for the city. The development of Danang city to become a green city, bringing benefits to all citizens is made by improving the urban environment and promoting urban transformation toward a clean, safe, comprehensive and effective energy direction. Danang sustainable city development project includes five components:

- Component 1: Environmental improvement - Collection and treatment of rainwater and wastewater.

- Component 2: Public transport improvement.

- Component 3: Construction of strategic road.

- Component 4: Strengthening capacity for managing urban.

- Component 5: Items from Danang priority infrastructure investment project.

Of which: Component 3 will be invested in expanding the strategic road network of the city to the newly planned urban areas for development. Currently, the two main roads in the south and the north have been built.

The Road DH2 from Hoa Son to Hoa Nhon located in the western area of Danang city, is one of the main roads facilitating the travel needs of the people of the communes in Hoa Vang District, helping connect the northern areas with the district administrative center, the southern and the southwest of Hoa Vang District.

Currently, the road has been damaged and downgraded, and its surface at many places is suffered from potholes and standing water, which affects the traffic safety and the travel of the people. To access the northern areas of the district from and to the south and southwest, and the district administrative center, the people mainly use the Hai Van - Tuy Loan bypass road, one of the routes that has been recorded with the biggest annual number of traffic accidents in the city.

However, in the future, the Hai Van - Tuy Loan bypass will be upgraded to a north – south expressway connecting with the 2 under construction La Son - Tuy Loan and Danang - Quang Ngai expressways. By then, the expressway will no longer be connected with the current roads directly and the connection can only be done at the interchange with roads DT602, Hoang Van Thai and Highway 14B. At that time, the entire north-south traffic flow in the area will mainly focus on the Road DH2 and this route will replace the current Hai Van - Tuy Loan bypass carry to play the role of the access artery to connect administrative centers, residential areas and current roads in the city's road network with the expressway. Once upgraded, the Road DH2 will attract a significant portion of traffic flow on the Hai Van - Tuy Loan bypass, helping reduce traffic pressure on this route as well as make improve the safety while travelling in the area. With its significant role as well as the urgent need to serve the

people, the investment in improving and upgrading the Road DH2 (Hoa Nhon - Hoa Son route) is essential, which helps promote socio - economic development of the area.

The work of improving and upgrading the DH2 (Hoa Son - Hoa Nhon) is of Component 3 – Strategic road construction under the Danang sustainable city development project approved by UBND Danang city at Decision No. 4945/QD-UBND dated 14/06/2011 on "approving alignment planning and land use boundary for the Road DH2 that links Hoa Nhon with Hoa Son"; Decision No. 7900/UBND-QLDTu dated 06/09/2014 of the People's Committee of Danang city on "Issues related to the Road DH2 improvement and upgrading works", and Official Document No. 11103/UBND-QLDtu dated 04/12/2014 of the City People's Committee Chairman on "Issues related to the Road DH2 improvement and upgrading work under the sustainable city development project".

Complying with the Environmental Protection Law, Decree No. 18/2015/ND-CP dated 14/02/2015 of the Government on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plan, this Project belonging to the group of transport projects according to Annex II of the Government Decree No. 18/2015/ND-CP must implement the environmental impact assessment and submit to Danang DONRE for appraisal and Danang CPC for approval.

2. Legal and technical bases of implementing EIA

The Project shall comply with applicable legal regulations of Vietnam and Donor on environmental protection, including:

2.1. Legal regulations of GoV on EIA report

**** Legal documents:***

- Environmental Protection Law No.55/2014/QH13 the National Assembly passed on 23/6/2014 and has been entered into force on 01/01/2015;
- Water Resources Law No.17/2012/QH13 the National Assembly passed on 21/06/2012;
- Land Law No.45/2013/QH13 the National Assembly of the Socialist Republic of Vietnam passed on 29/11/2013 and has been effective since 01/07/2014;
- Fire Prevention and Fire Fighting Law No.27/2001/QH10 dated 29-6-2001 of the National Assembly;
- Law No. 40/2013/QH13 dated 22 November 2013 on amending and supplementing a number of Articles of Law on Fire prevention and fighting;
- Construction Law No. 50/2014/QH13 issued on 18 June 2014 and took effect since 01 January 2015;
- The Government's Decree No. 18/2015/ND-CP dated 14 February 2015 on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection plan;
- The Government's Decree No. 19/2015/ND-CP dated 14 February 2015 guiding the implementation of a number of articles of Land on Environmental Protection;
- Decree No. 25/2013/ND-CP dated 29 March 2013 of the Government on environmental protection charges for wastewater;

- Decree No. 174/2007/ND-CP dated 29 November 2007 of the Government on environmental protection charges for wastewater;
- Decree No. 88/2007/ND-CP dated 28 May/2007 of the Government on urban drainage and industrial zones;
- Decree No.179/2013/ND-CP dated 14/11/2013 of the Government on sanctioning of
- Decree No.43/2014/ND-CP dated 15/5/2014 of the Government, detailing the implementation of some articles of the Land Law;
- Decree No.140/2006/ND-CP dated 22/11/2006 by the Government, promulgating the regulations on the environment protection in the stages of formulation, appraisal, approval and organization of implementation of strategies, planning, plans, programs and development projects;
- Decree No.117/2009/ND-CP dated 31/12/2009 of the Government on the handling of law violations in the environmental protection field;
- Decree No.59/2007/ND-CP dated 09/4/2007 of the Government, enacting the Solid Waste Management;
- The Government's Decree No. 38/2015/ND-CP dated 24 April 2015 on management of wastes and scraps;
- The Government's Decree No. 80/2014/ND-CP dated 06 August 2014 on wastewater drainage and treatment and took effect since 01 January 2015;
- Decree No.59/2015/ND-CP dated 18 June 2015 of the Government on management of construction and investment projects of works;
- Decree No.83/2009/ND-CP dated 15/10/2009 of the Government, amending and supplementing a number of articles of Decree No.12/2009/ND-CP on management of construction and investment projects of works;
- Decree No.149/2004/ND-CP dated 27/07/2004, regulating the licensing for exploration, exploitation and use of water resources, discharge of wastewater into water sources;
- Circular No. 27/2015/TT-BTNMT dated 29 May 2015 of the Ministry of Natural Resources and Environment on strategic environmental assessment, environmental impact assessment and environmental protection plan;
- Circular No.22/2010/TT-BXD dated 03/12/2010 of the Ministry of Construction on the regulations on labor safety in construction of works;
- Circular No. 09/2009/TT-BXD dated 21 May 2009 of the Ministry of Construction detailing the implementation of a number of Articles of Decree No. 88/2007/ND-CP dated 28 May 2007 of the Government on urban drainage and industrial zones;
- Circular No. 36/20015/TT-BTNMT dated 30 June 2015 of the Ministry of Natural Resources and Environment, on hazadous waste management;
- Circular No.19/2011/TT - MOH dated June 6, 2011 of the Ministry of Health, guiding the management of occupational health, employee health and occupational disease;
- Circular No.16/2009/TT-BTNMT and Circular No.25/2009/ BTNMT of the Ministry of Natural Resources and Environment on the issuance of Vietnam's national standards;

- Circular No. 32/2013/TT-BTNMT dated 25 October 2013 of the Ministry of Natural Resources and Environment on issuance of national technical regulations on environment;
- Circular No. 10/2007/TT-BTNMT dated 22 October 2007 on guidance on quality insurance and control in environmental monitoring;
- Circular No. 02/2005/TT-BTNMT dated 24 June 2005 of the Ministry of Natural Resources and Environment on guiding the implementation of the Government's Decree No. 149/2004/ND-CP dated 27 July 2004;
- Decision No. 33/2013/QD-UBND dated 13 August 2012 of Danang Provincial People's Committee on management, operation and using of urban drainage system and industrial zones in Danang province;
- Decision No. 57/2012/QD-UBND dated 07 December 2012 of Danang Provincial People's Committee on amendment and supplementation of a number of articles of Regulation on management, operation, exploitation and using of urban drainage system and industrial zones in Danang under Decision No. 33/2012/QD-UBND dated 13 August 2012 of Danang Provincial People's Committee;
- Decision No. 23/2010/QD-UBND dated 10 August 2010 of the City People's Committee, issuing regulations on environmental protection in Danang province.
- Decision No.02/2009/TT-BTNMT dated 19 March 2009 of the Ministry of Natural Resources and Environment on the assessment of the water receiving of water sources;
- Decision No.16/2008/QD-BTNMT dated 31 December 2008 by the Ministry of Natural Resources and Environment, promulgating the national technical regulations on the environment;
- Decision No.22/2006/QD-BTNMT dated 18 December 2006 by the Ministry of Natural Resources and Environment for the mandatory application of Vietnam's environmental standards;
- Decision No.505 BYT/QD dated 13 April 1992 by the Ministry of Health on the issuance of the hygiene standard.

**** Project-related legal bases:***

- Decision No. 927/QD-UBND dated 29 January 2013 on approving the Danang Sustainable City Development Project;
- Dispatch No. 1355/UBND-QLDTu dated 15 March 2011 of Danang CPC on "investment policy on improvement and upgrading of the road DH2 from Hoa Nhon to Hoa Son";
- Decision No. 4945/QD-UBND dated 14 June 2011 of the Chairman of Danang CPC on "approving the alignment planning and land use boundary of the road DH2 from Hoa Nhon commune to Hoa Son commune";
- Decision No. 7900/UBND-QLDTu dated 06 September 2014 of Danang CPC on "the project: improvement and upgrading of the road DH2";
- Dispatch No. 11103/UBND-QLDTu dated 04 December 2014 of the Danang CPC on "the project: Improvement and upgrading of the road DH2 under the SCDP".

**** Applicable Vietnam's standards and Codes:***

During the preparation of EIA report, following applicable Vietnam's standards to be applied to the project include:

Water 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/BTNMT - National technical regulation on underground water
- quality.
- QCVN 14:2008/BTNMT - National technical regulation on domestic wastewater.
- QCVN 40:2011/BTNMT - National technical regulation on industrial waste water.
- QCVN 25:2009/BTNMT - Wastewater of solid waste landfill site: Regulating maximum allowable concentration of wastewater of solid waste landfill sites when discharging to receiving source.
- TCVN 5502:2003 – Domestic water supply - Quality requirements.
- TCVN 6773:2000 - Water quality - Quality of water used for irrigation.
- TCVN 6774:2000 - Water quality – Fresh water quality guidelines for protection of aquatic life.
- TCVN 7222:2002 – Water quality – Quality of water from the centralized domestic wastewater treatment plants.

Air quality:

- QCVN 05:2013/BTNMT – Air quality – National technical regulation on ambient air quality.
- QCVN 06:2009/BTNMT – Air quality – Permitted maximum concentration of hazardous substances in ambient air.
- TCVN 6438:2001 - Road traffic means - Permitted maximum level of exhaust gas.

Solid waste management:

- Decision No. 27/2004/QD - BXD dated 09 November 2004 of the Ministry of Construction on promulgating Vietnamese Construction Standard TCXDVN 320:2004 - "Hazardous waste landfills - Design standards".
- TCVN 6696:2009 – Solid waste – Sanitary landfill sites – General requirements for environmental protection.
- QCVN 07:2009/BTNMT – National technical regulation on hazardous waste thresholds.
- QCVN 25:2009/BTNMT - National technical regulation on wastewater of the solid waste landfill sites.

Quality of soil and sediment:

- QCVN 03:2008/BTNMT – Soil quality - National technical regulation on the allowable limits of heavy metals in the soils.
- QCVN 15:2008/BTNMT - Soil quality - National technical regulation on the pesticide residues in the soils.
- QCVN 43:2012/BTNMT - National technical regulation on sediment quality in fresh water areas.

Noise and vibration:

- QCVN 26:2010/BTNMT - National technical regulation on noise.
- TCVN 5948:1999 - Acoustic - Noise emitted by accelerating road vehicles - Permitted maximum noise level.
- QCVN 27:2010/BTNMT - National technical regulation on vibration.

Water supply and drainage:

- TCVN 7957:2008 - Drainage and sewerage - External Networks and Facilities - Design Standard
- TCXDVN 33:2006 - Water Supply - Distribution System and Facilities. Design Standard.

Labor safety and health:

- Decision No. 3733/2002/QĐ-BYT dated 10 October 2002 on application of 21 standards on safety and health.

2.2. Safeguards policies of WB

Table 0-1: Environmental safeguard policies of WB

Policies	Reasons of activation
OP/BP 4.01 – Environmental assessment	The works involved in construction of transport infrastructure, therefore, during the construction, it will cause negative environmental impacts.
OP/BP 4.11 – Physical cultural resources	- The project will affect some graves scattered in cemeteries and in need of relocation. The Consultant carried out consultation with owners of these graves and local authorities. The results of consultation showed that they support the project and willing to relocate their graves as long as they receive adequate assistances. - In addition, there is no local religious or cultural works to be affected by the project.
OP/BP 4.12 - Involuntary resettlement	- The project will acquire land and non-land assets, including residential land and structures, agricultural land and some infrastructure. - The survey results and statistics showed that the construction of the project will affect an area of 191,223m^2, including 50,977m^2 of residential land. Simultaneously, the project will affect 664 households

Policies	Reasons of activation
	and 02 organizations (ward/commune People's Committees), of which 411 households are impacted with residential land; 276 households are impacted with housing and 109 households have to relocate.
Information access	The first draft of the project information booklet (PIB) will be summaized and disseminated for the localities where the project is located (Hoa Nhon and Hoa Son communes) for collecting opinions and comments. The consultations were carried out in two communes through invitation of the affected persons to attend the meetings at the commune People's Committee for collecting opinions. Comments from local people and authorities will be incorporated in the report. After the final report is approved, it will be publicly disclosed at the localities.

3. Implementation Agencies of EIA

The EIA report of the Improvement and Upgrading of the Road DH2 Project of which Danang Department of Transport is appointed as Client and PIIP-PMU shall be responsible for managing the project.

EIA Preparation Consultant:

- Vietnam Investment and Development Consultancy Co., Ltd. (IAC Vietnam)
- Address: No. 50 Ngo Huyen, Hang Trong ward, Hoan Kiem district, Hanoi
- Tel: 04-6 6251 0258
- Fax: 04-6 6251 0258 E-mail: info@iacvietnam.com
- Director: Mr. Nguyen Van Trung

Table 0-2: List of Staff Preparing EIA report

No.	Full name	Discipline	Responsibilities
I. Representative of the Client			
1	Mr. Luong Thach Vy		Director of PMU
2	Mr. Le Anh Duc	Environmental Management	Project Management
3	Mrs. Vo Thi Truc Ly	Environmental Management	Project Management
II. Consultant Specialists			
1	Doan Manh Hung	Master of Environment	Team Leader/ Lead in preparing EIA report
2	Nguyen Manh Truong	Bachelor of Sociology	Public Consultation, social impact assessment
3	Nguyen Thi Ngoc Anh	Master of Sociology	Public consultation, social impact assessment; preparing RP

No.	Full name	Discipline	Responsibilities
4	Lai Viet Thang	Master of Biotechnology	Field survey; environmental impact assessment
5	Phung Thanh Tung	Transport Engineer	Designing infrastructure
6	Nguyen Thi Thu Phuong	Bachelor of Economics	Cost estimate

4. Methods to be applied during the implementation of EIA report

During the study, survey and preparation of EIA report, the Consultant applied a range of following study methods:

4.1. Methods of Environmental Impact Assessment

- ***Rapid assessment method:***

The Rapid Assessment Method is used for calculating wastewater and air pollution in the project area. This method was proposed by the World Health Organization (WHO) and accepted in several countries. In Vietnam, this method is introduced and applied in many EIA study, relatively performing the accurate calculation of the pollution load in the context of limited instrumentation and analysis. In this report, the pollution load coefficients are taken under the EIA guidelines of the World Bank *(Environmental Assessment Sourcebook, Volume II, Sectoral Guidelines, Environment, World Bank, Washington D.C 8/1991)* and *Handbook of Emission, Non-Industrial and Industrial source, Netherlands.*

- ***Comparison method:***

- The comparison method is to assess the environmental quality, effluent quality, pollution load, etc. On the basis of comparison with the concerning environment norms and standards, the regulations of the Ministry of Health as well as the concerning researches and related experiments in the world.

- ***Identification method:***

This method is applied through the following specific steps:

- Describe the environment system.
- Identify the project components that affect the environment.
- Identify the full range of related waste streams, environmental issues to serve the detailed evaluation.

- ***Listing method:***

It is used quite common (since the establishment of the National Environmental Protection Agencies in some countries - NEPA) and bring positive results thank to many advantages as clear approach, systematic provision during system analysis and evaluation. It includes 2 main categories:

- *The description listing table*: This method lists the environment components in need of research in addition to the information on the measurement, prediction and evaluation.
- *The simple listing table*: This method lists the environment components in need of study which is possibly affected.

- ***Systematic analysis method***

- This method is applied fairly common in the environment analysis. The advantage of this approach is the comprehensive assessment of impacts, which is useful in identifying effects and waste sources.

- This method is applied based on the review of waste sources, impact sources, affected objects, environmental components, etc. like the elements in a system that has close relationship with each other, thereby, to identify, analyze and evaluate impacts.

4.2. Other methods

- ***Public consultation method***

- This method is applied during the interview with local officials and residents for collecting necessary information for the EIA of the Project. Namely, introducing them benefits and possible negative impacts on the environment and their lives. On this basis, make the sum of feedback about the project and expectations of local people.

- On the other hand, discuss and interview directly with local officials and residents on local socio-economic development situation.

- ***The information and data inheriting, synthesizing and analyzing method:***

- The method is to identify, assess natural, economic - social conditions in the project area through the data and information collected from various sources such as Statistical Yearbook, regional social – economic reports, regional environmental status and involved research work.

- At the same time, it inherits available studies and reports which are really necessary because it inherits previous results, simultaneously, improve limitations.

- ***Field survey method:***

- The field work is required to carry out the environmental impact assessment to determine the current status of land for the project implementation, concerned adjacent objects, surveys to choose sampling locations, survey the current state of water supply, drainage, power supply...

- The consulting agency conducted topographical, geological survey, collecting meteorological data to serve the design in accordance with the current standards of Vietnam. The survey results are used to evaluate the natural conditions of the project area.

- ***Expert method:***

Based on knowledge and experiences in the environmental science of the environmental impact assessment experts of the Consultant and other scientific research units.

- ***The sampling and sample analyzing method in laboratory:***

- The sampling and analysis of samples of environmental elements (soil, water, air) is integral in identifying and assessing the current state of the baseline environmental quality in the project area.

- After the field survey, the sampling program and sample analysis will be set up with the main content such as sampling locations, measurement and analysis parameters, human

resources, necessary equipment and tools, duration, sample preservation plan, analysis plan, etc.

- For this project, the project owner coordinated with the Meteorology Station in the Central region to organize monitoring, sampling and analysis of the air, water, soil, sediment and aquatic samples in the project area to assess the status of the quality of the environment components.

Sampling, analyzing and storage of samples shall comply with current Vietnam standards:

+ *For air*:

Height of sampling position calculated from ground is 1.5m. Air samples are collected on imperger pipe by air sampling pump, Sampler (America) Model: 224.PCXR8. Dust samples are collected by air collection pump KIMOTO (Japan).

Dust: Sampling and analyzing according to Vietnam standard TCVN 5067:1995, sampling device: KIMMOTO, weigh on analytical balance: Sartorius BP 211D, sensitiveness 1x 10^{-5}gr (Germany).

SO_2: Collecting sample on Kimmoto Handy Sample HS-7- Japan, according to Vietnam standard TCVN 5971:1995. Sample analyzer by colorimeter on UV spectrum -1691 PC…

CO: Sampling and analyzing according to standard HD.5.7-13.

+ *For analyzing samples of water, soil and sediment*

Vietnam's standard TCVN 6663-6:2008: Guidance on sampling of rivers and streams. TCVN 5999:1995: Guidance on sampling of wastewater. TCVN 6663-11:2011: Guidance on sampling of ground water. TCVN 7176:2002 – Methods of biological sampling. TCVN 6663-3:2000: Guidance on sampling of sewage sludge and sediment. TCVN 6663-3:2008: Guidance on preservation and handling of samples.

Parameter analyzing methods according to Vietnam's standards and ISO, including:

1- pH: Directly measured by digital meter - Wagtech, according to TCVN 6492:2011.

2- DO: Directly measured by digital meter - Wagtech, TCVN 7325:2004.

3- Total suspended solid (TSS): Weight method, TCVN 6625:2000.

4- BOD_5: BOD Track analyzer, according to TCVN 6001-1:2008.

5- COD: COD analyzer brand HACH, includes colorimeter DR/890, sample destroying stove according to SMEWW 5220 D:2012.

6- Hardness: Analyze on two-channel ion chromatography LC-0ADVP, Detector CDD according to TCVN 6224-1996.

7- NH_4^+-N: UV-VIS Spectrophotometer Model Shimazu UV - 1691 PC theo SMEWW 4500-NH_3 F:2012.

8- NO_3^--N: Analyze on UV-VIS Spectrophotometer Model Shimazu UV - 1691 PC according to EPA 352.1.

9- PO_4^3: Analyze on two-channel ion chromatography LC-0ADVP, Detector CDD or UV-VIS Spectrophotometer Model Shimazu UV - 1691 PC according to TCVN 6202:2008.

10- SO_4^2: Analyze on two-channel ion chromatography LC-0ADVP, Detector CDD or UV-VIS Spectrophotometer Model Shimazu UV - 1691 PC according to SMEWW 4500 SO_4^{2-} E:2012

11- Cd, Zn, Fe, Pb, Cu, Cd…: Analyze according to SMEWW 3113B:2012, As according to TCVN 6626:2000, Hg according to TCVN 7877:2008, on atomic absorption spectrum Model AAS-800.

12- Mineral oil: Weight method, TCVN 5070:1995.

13- Coliform: Pipe method, TCVN 6187-2:1996.

14- Chloride: Two-channel ion chromatography analysis equipment LC-0ADVP, Detector CDD according to Vietnam's standard TCVN 6494-1:2011.

CHAPTER 1: DESCRIPTION OF THE PROJECT

1.1. Name of project

Project: **"*improvement and Upgrading the Road DH2 (Hoa Nhon – Hoa Son)*".**

1.2. Project Owner

***The Project Owner**:* Da Nang City People's Committee.

Executive Agency: PMU of Danang Priority Infrastructure Investment Project (PiiP-PMU)

- Address: 54 Thai Phien, Hai Chau District, Da Nang city
- Tel: 0511 562 677 - 562679 Fax: 0511 562678
- Legal representative of the Project Owner: Mr. Luong Thach Vy – Director of PMU

Project Approver: Danang City People's Committee.

1.3. Geographical position of the project

The road DH2 is located in Hoa Nhon and Hoa Son communes, Hoa Vang district, Danang city.

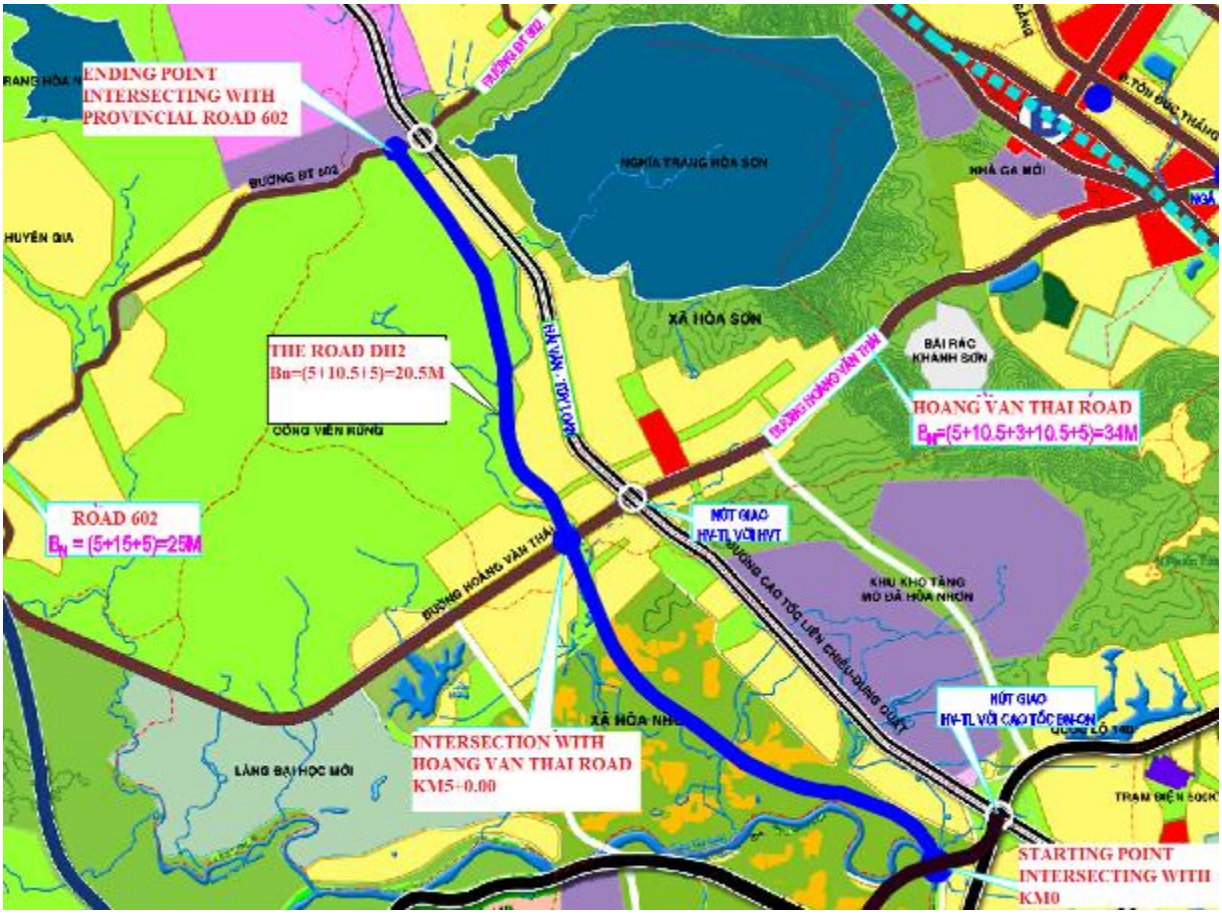


Figure 1-1: Position of the road DH2 (Hoa Nhon – Hoa Son)

**** Status of the road DH2:***

The road DH2 connects from Hoa Nhon commune to Hoa Son commune in Hoa Vang district, Danang city. The road connects from National Highway 14B to the provincial road 602, in length of 9.2 km. The starting point at (Km0+0,00) intersecting with National highway 14B at

the head of Giang bridge, intersecting with Hoang Van Thai road at Km5+0,00 and the ending point at (Km9+228,07) intersecting with the provincial road 602 at the position 200m away from Tung Son bridge. The road runs toward the East-West in parallel and 30-1,100m away from the Hai Van – Tuy Loan road. The road is designed with cross section of 2 lanes. The terrain of the road is mainly rice fields and some sections pass through the low-lying hills with the elevation varying from 2.5m to 30m and not large cross slope. The residents living on the road are mainly concentrated in the areas with high terrain where flooding hardly happens and cultural centers, schools and markets are concentrated.

The road passes through the sensitive works such as Hoa Nhon recreation area, Hoa Nhon 1 primary school, Hoa Nhon medical station, Hoa Nhon market, Hoa Nhon 2 primary school, the Agent Orange sponsoring center, Phu Pha village communal house, Phu Ha cathedral, Hoa Son 1 primary school, Loc Quang church, Xuan Phu temple, Phu Thuong cathedral, Hoa Sơn dressed stone trade village and Hoa Son communal martyrs cemetery.

The road DH2 passes through the residential areas of villages namely: Phu Thuong, Phu Ha, Xuan Phu and Tung Son in Hoa Son commune and villages Phuoc Hung, Phuoc Thai, Thach Nham Tay, Thai Lai and Phu Lai in Hoa Nhon commune, Hoa Vang district, Danang city

In addition, many high voltage (66kV - 220kV), medium voltage (22kV – 35 kV) and low voltage (0.4 kV) lines exist in the project area.

Starting point intersecting with provincial road 604 (Km0+00)

Hoa Nhon communal health center (Km1+383)

Hoa Nhon primary school No. 1 (Km1+480)

Hoa Nhon primary school No. 2 (Km3+295)

Cross with Hoang Van Thai road (Km5+00)

Ending point intersecting with provincial road 602 (Km9+228)

The Agent Orange sponsoring center (Km4+300)

Phu Ha village hall (Km5+286)

Hoa Son dressed stone trade village (Km5+700)

Phu Ha cathedral (Km6+00) from the cathedral to the road about 10m

Loc Quang pagoda(Km7+00) the distance to road about 15m

Hoa Son Primary No.1 (Km7+100)

Phu Thuong Cathedral (Km7+838)

Hoa Son communal martyrs cemetery (Km9+00)

Figure 1-2: Some pictures of the road

Figure 1-3: Location map of sensitive works surrounding the project area

a) Road DH2 base:

- Road surface width : 5.5m;
- Road sides width : 2 x 1,0m;
- Roadbed width : 7,5m;
- The road surface of section from the road end to Km8+500 is asphalt-penetrated.
- Section from Km8+500 to the other road end has been repaired with a concrete asphalt road surface structure.

Currently, the road is damaged and downgraded due to less maintenance and repair, and big traffic flow, especially the section passing Hoa Son commune where accommodates many split rock production facilities, suffers from heavy load vehicles at high frequencies making its road surface damaged and obstructing the people's travel, especially causing local congestion during the rainy season.

b) Load capacity:

- Road : 9.5T.
- Structures : H13 truck

c) Flood frequency:

- Section Km0+0.00 - Km2+217.00 : Annually flooded.
- Section Km2+217.00 - Km9+197.20 : P = 4%.

The road alignment from Km0+00 to Km2+217.00 is frequently suffered from flood(annually flooded), in the flood season water from the basins associated with rising water from Tuy Loan river, which causes flood in the whole area. Section Km2+217.00 – Km9+197.20 current status is designed with frequency flood frequency of 4%.

d) Structures:

The system of bridges and culverts on the road invested long time ago with the H13 load capacity does not ensure load capacity for the current traffic flow, specifically:

- F75 - 3F125 aperture culverts: 36 pieces
- Various bridges as listed in the table below:

No.	Bridge name	Location	Features	Length (m)
1		Km0+166.00	reinforced concrete slab bridge	3.0
2	Dong Gia	Km0+463.00	reinforced concrete slab bridge	6.0
3		Km2+563.00	reinforced concrete slab bridge	7.0
4	Voi bridge	Km4+957.00	reinforced concrete slab bridge	9.1
5	Trang bridge	Km5+927.60	reinforced concrete slab bridge	6.0
6	Lau Qua bridge	Km6+874.90	reinforced concrete slab bridge	9.0
7		Km7+565.34	reinforced concrete slab bridge	3.0
8	Tung Son bridge	Km9+188.00	reinforced concrete slab bridge	4.0

e) Intersections:

Road DH2 has 5 junctions including one with the old National road 14B, one with Road 18 (Cay Thong crossroad), one with Hoang Van Thai road (DH1), one with Road 21 (to the city's cemetery), one with Road 602 (Tung Son crossroad) and one with Road 604 (from Tuy Loan – National road 14G). The other remaining crossing roads are small (2 - 3.5m wide).

Therefore, when the project comes into construction, the project area can be approached directly via the existing roads above. However, the reinforcement of structures on these lines and restoration their original state after the construction is complete should be taken into account.

f) Protection works and traffic safety:

Protection works on the road are hardly invested. The negative slope at section Km8+550 - Km8+650 has just been reinforced with mortared rip rap structure.

The traffic safety system invested long time ago is now degrading.

g) Domestic electricity and lighting system:

The electricity supply system has been invested but the lighting system is unavailable.

1.4. Scope of the Project

1.4.1. Objectives of the Project

Main objectives of the Project:

- Renovate and upgrade the Road DH2 to be one of the major transportation routes serving travel needs of people's communes in Hoa Vang district, which connects the northern region with the District Administration Center, the Southern and the Southwest regions of Hoa Vang district.

- Together with the southern backbone links of city (Hoa Phuoc – Hoa Khuong road) and the Western ring road to create a synchronous and high quality transport system for travelling in urban and peri-urban areas.

1.4.2. Scope of the Project

- The DH2 road alignment with length of 9 Km connected to the old 14B National Highway and the 602 provincial road is renovated and upgraded by expanding asphalt concrete road with the width from 7.5m to 10.5m and width of 5m roadside from each side. The height of road DH2 road baseline will be renovated from 2m to 3m compared with the road's current road.

- The current road has 2 sections (section Km0+212 – Km0+924 and section Km1 + 514 – Km2+355) is in the lowland, frequently flooded. Thus, the DH2 road will be adjusted road alignment at these two sections. Details are as below:

+ Section Km0+212 – Km0+94: turning left alignment compared with the current road, passing through agricultural land area.

+ Section Km1+514 – Km2+355: turning right alignment compared with the current road, the new road alignment passing through the hill. The survey shows that there are not rare species in this hill. According to this new road alignment, the number of resettlement compensation increases significantly; however, it's possible to solve the current flood for this road.

- To adjust by increasing the road horizontal curve radius at some locations on the alignment in order to ensure traffic safety in the operation phase.

- Section Km8+850 to the end of route: this alignment follows the current road (not round Hoa Son communal martyrs cemetery) so as to mitigate site clearance, resettlement and create a safer intersection with DT602 road.

1.4.2.1. Location and function of the road DH2:

- Connects with the National Highway 14B to the city center, Hoa Vang administrative center, Hoa Cam industrial park and National Highway 1A.

- Connects with the provincial road 602 to the center of communes or the administrative, political, cultural and social centers of the North of the district, Ba Na tourism area, Hoa Khanh industrial park or the universities in Lien Chieu district.

- Connects with Hoang Van Thai road to Ba Nga tourism area or National highway 1A in Hoa My locality.

- Connects with inter-commune road 21 – Nam Cao to National Highway 1A at the area of Danang University of Education.

1.4.2.2. Scale and specifications of the road

Scale and specifications of the road DH2 are designed as the table below:

Table 1-1: Specifications of the road DH2 (Hoa Nhon - Hoa Son)

No.	Main specifications	
1	Applicable standard	TCXDVN 104 - 07
2	Road grade	urban artery road
3	Entire road cross section	20.5m
4	Design speed (km/h)	50
5	Speed at intersection (km/h)	20
6	Load capacity: - Structures - On line ditch, pavement - Road base	HL93, H30-XB80 400Kg/m^2 120KN
7	Frequency:	5%
8	1 directional sight range (m)	55
9	2 directional sight range (m)	115
10	Maximum vertical slope (%)	4
11	Horizontal road slope (%)	2
12	Min horizontal curve radius (m)	100
13	Min vertical curve radius (m) - Convex - Concave	 1,200 1,000
14	Road surface structure	A1
15	modulus of elasticity Eyc (daN/cm^2)	155
16	Width / road surface horizontal slope	10.5m /2%
17	Width / pavement horizontal slope	2x5.0m /2%

Source: Description of the Feasibility Study of the Project

Other technical infrastructures such as power supply, water supply, lighting system, optical cables and communications will be invested synchronously according to the standards of each sector.

1.4.3. Design volume of work items of the road DH2

1.4.3.1. Design of the road

1) Alignment of the road:

- The alignment of the road is basically designed according to Decision No. 4945/QD-UBND dated 14 June 2011 of Danang city People's Committee on "approving the alignment planning and land use boundary of the road DH2 from Hoa Nhon to Hoa Son". The starting point at Km0+0,00, intersecting with National Highway 14B at the head of Giang bridge(in Hoa Nhon commune), the route crosses the extended Hoang Van Thai road at Km4+987,65 (X =

772775,387; Y = 511902,487) and the ending point at Km9+228,07 intersecting with the provincial road 602(in Hoa Son commune). Total length of the new road alignment is 8,924.6m. Of which, the road crosses the residential area in length of 5,257.46m.

In this project, the DH2 road is considered for local adjustments to some sections as follows:

a) Increasing the road horizontal curve radius at some points and road alignment and the route from section Km8+850 to its end section:

** Adjustment by increasing the road horizontal curve radius:*

Some curves lie on the route is designed with ordinary minimal radius R = 100. However with ground conditions allowed, at these positions, it's possible to layout the larger road horizontal curve radius to increase traffic safety in the operation phase. The adjusted option as follows:

- Adjustment by local increasing horizontal curve radius at points D6 (Km1+610) from R=200 to R=400; the points: D8 (Km1+975); D14 (Km3+770); D16 (Km4+471); D22 (Km5+909); D24 (Km6+366); D28 (Km7+131) from R=100 to R=200.

** The alignment at section from Km8+850 to the end of road alignment:*

At this section, alignment goes along the old road, passing Hoa Son cemetery, crossing with the provincial road 602 at the current intersection 40m far away Tung Son over bridge to avoid a cut through the hill slope and residential area. The alignment option follows the project schedule as required in order to serve as a branch of completed intersection between Hai Van – Tuy Loan road with DT602 road in the future, and create an intersection with DT602 road with higher safe.

Figure 1-4: Alignment section Km8+850 to the end of route

b) Adjusting road alignment at 2 sections Km0+212- Km0+924 and Km1+154 – Km2+355:

The road crosses through section Km0+0.00 - Km2+158.39 in the area where flood regularly happen and population is crowded. In rainy season, flood water flows from basins and combines with water of Tuy Loan river and cause flooding to whole area. According to survey results, in annual rainy season, the road is flooded in depth of 0.5 – 1.5m, especially in 1999; flood level was 2-3.5m. To ensure harmony between flood frequency and current elevation of the residential areas in two sides of the road, the Design Consultant proposed 2 alternatives at 2 sections (in the alignment area with frequently flood from Km0+00 – Km2+158.39) as follows:

* ***Alternative 1*: (frequency of annual over flood**)

These two sections follow the current road, designing the height of red road (the height designed of core road) is designed with frequency of annual over flood h= 4.52m. With this alternative, the time of construction is short, the volume of site clearance is small due to taking advantage of the current road; however, the alternative has major disadvantages in the case of the flood occurs, the road will be flooded, causing traffic congestion and difficulties in urban development.

Total length of the road L = 9068,26m.

* ***Alternative 2 (Frequency of over flood 5%)***:

- Elevation of red boundary line is designed with frequency of P = 5% (the drainage culvert is designed with frequency of p = 5%);

- Adjust:

Section Km0+212 - Km0+924: The road follows the boundary approved to the section Km0+212, then turns left and crosses the rice fields which are 100m away from the old centerline and merges into the old road at Km0+924.

Section Km1+514 - Km2+355: at Km1+514, the road bends right, passing a low hill area which is 110m far from the old road center and merging the old road at Km2+355.

Total length of the road L = 8,924.6m.

With this alternative, the construction period will be extended because the roadbed is designed higher; site clearance and resettlement are higher than the alternative 1. However, the alignment under the alternative 2 will ensure to improve flooding condition, investment performance and favorable urban development in the future. Hence, this alternative has been selected.

New alignment chart under the alternative 2 of 2 sections is shown in the figure below.

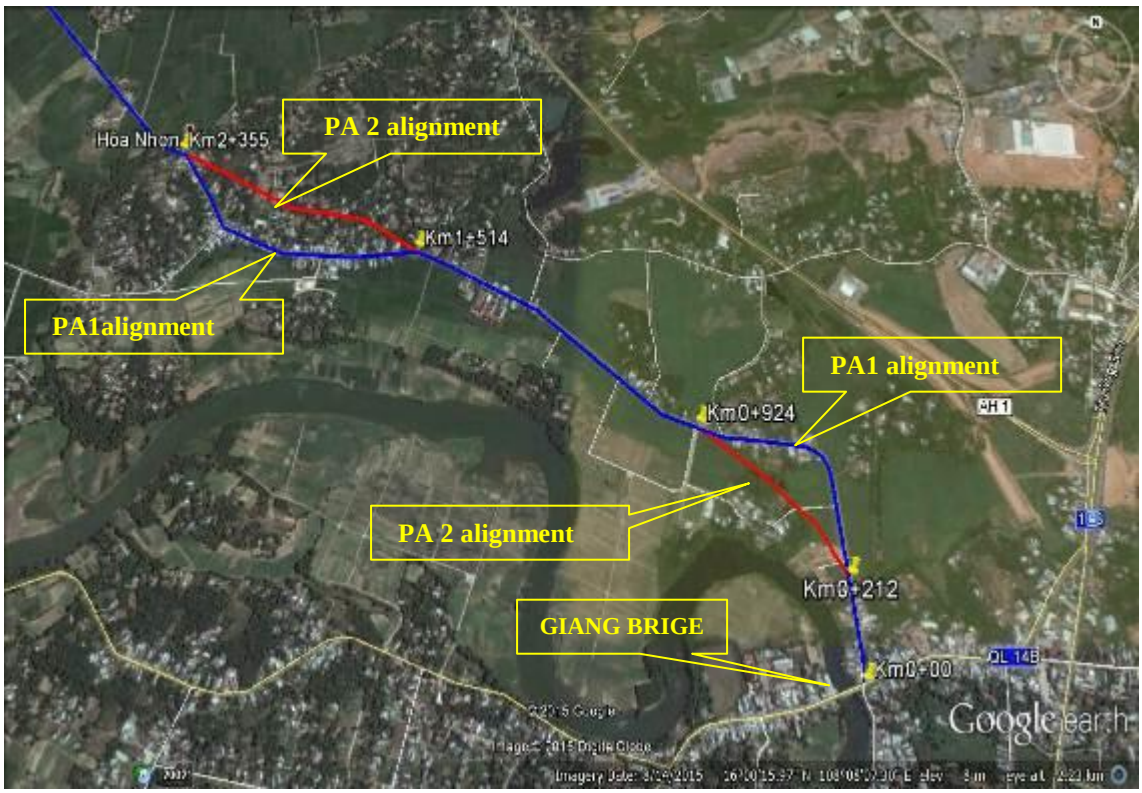


Figure 1-5: Alternative of Alignment section Km0+212 – Km0+924 and section Km+514 – Km2+355

Table 1-2: Vertex coordinate of the road DH2 (Hoa Nhon – Hoa Son)

No.	Vertex	X	Y	No.	Vertex	X	Y
1	DDA	1769540.626	541733.383	18	Đ22	1773327.761	537906.923
2	Đ1	1769854.906	541693.068	19	Đ23	1773541.763	537918.778
3	Đ2	1770075.638	541267.111	20	Đ24	1773785.840	537957.958
4	Đ5	1770331.202	540946.470	21	Đ25	1774083.543	537819.653
5	Đ7	1770496.584	540514.196	22	Đ26	1774294.363	537787.357
6	Đ8	1770551.43	540203.461	23	Đ27	1774381.482	537818.211
7	Đ11	1770754.711	539813.857	24	Đ28	1774514.768	537818.359
8	Đ12	1771270.046	539295.135	25	Đ29	1774736.529	537743.127
9	Đ13	1771424.439	539131.681	26	Đ30	1774902.174	537653.187
10	Đ14	1771580.797	538921.040	27	Đ31	1775196.616	537579.813
11	Đ15	1771918.876	538709.778	28	Đ32	1775438.968	537489.342
12	Đ16	1772171.328	538538.372	29	Đ33	1775572.187	537485.224
13	Đ17	1772450.427	538554.817	30	Đ34	1775845.786	537287.734
14	Đ18	1772601.147	538544.699	31	Đ35	1776013.067	537080.549
15	Đ19	1772915.422	538356.879	32	Đ36	1776141.667	537015.741
16	Đ20	1773160.813	538223.476	33	CDA	1776211.444	536959.780
17	Đ21	1773201.816	538040.143				

Source: Description of Feasibility Study of the Project

The alignment of Alternative 2 ensures to improve the flooding situation, investment efficiency and facilitate urban development in the future. This alignment is approved by Danang city People's Committee.

- Layout: According to coordinate system VN2000, axis meridian: 107°45', projection zone 3°.

- Elevation: According to the national elevation system at Hon Dau – Hai Phong.

2) Selection of alternatives:

Although desired number of lanes is 4, the selected alternative is 2 lanes due to limited investment funding. Traffic flow will be inspected after this road is put into operation. Supplement of lanes will be determined depending on the increasing traffic flow. The 2-lane alternative was approved by Danang city People's Committee under Decision No. 4945/QD-UBND dated 14 June 2011 of Danang city People's Committee and specified through the master plan on transportation and public works of Danang city.

3) Horizontal alignment:

On the basis of the approved alignment, the Design Consultant carried out the survey for setting out in field. The horizontal alignment is designed according to the secondary road. The minimum horizontal curve radius Rmin =100m. Design results are as follows:

Table 1-3: Summary of horizontal curve elements

No.	Crest	Angle A	R(m)	T(m)	P(m)	K/2(m)	ln(M)	I_{SC}(%)	W(M)	Direction
1	ĐĐA									
2	Đ1	180D27'37"	Not driving bend							right
3	Đ2	100D58'03"	100	82.48	29.63	68.97	25.00	4.00	0.40	left
4	Đ3	189D49'10"	200	17.18	0.74	17.14	12.00	2.00	0.30	right
5	Đ4	204D37'08"	200	43.64	4.71	42.97	12.00	2.00	0.30	right
6	Đ5	162D22'48"	200	31	2.39	30.75	12.00	2.00	0.40	left
7	Đ6	152D42'56"	200	48.54	5.81	47.62	12.00	2.00	0.30	left
8	Đ7	185D04'41"	400	17.74	0.39	17.73	12.00	2.00	0.00	right
9	Đ8	202D52'21"	100	20.23	2.03	19.96	25.00	4.00	0.40	right
10	Đ9	212D48'58"	100	29.45	4.25	28.64	25.00	4.00	0.40	right
11	Đ10	153D08'07"	100	23.88	2.81	23.44	25.00	4.00	0.40	left
12	Đ11	197D15'32"	200	30.35	2.29	30.12	12.00	2.00	0.30	right
13	Đ12	178D33'17"	1000	12.61	0.08	12.61	0.00	0.00	0.00	left
14	Đ13	173D13'10"	1000	59.24	1.75	59.17	0.00	0.00	0.00	left
15	Đ14	201D24'46"	100	18.91	1.77	18.69	25.00	4.00	0.40	right
16	Đ15	177D49'33"	2000	37.95	0.36	37.95	0.00	0.00	0.00	left
17	Đ16	217D32'48"	100	33.99	5.62	32.77	25.00	4.00	0.40	right
18	Đ17	172D47'15"	400	25.21	0.79	25.18	12.00	2.00	0.00	left
19	Đ18	152D58'38"	100	24.03	2.85	23.58	25.00	4.00	0.40	left
20	Đ19	182D20'01"	1000	20.37	0.21	20.36	0.00	0.00	0.00	right
21	Đ20	131D08'12"	60	27.26	5.9	25.58	Intersection			left
22	Đ21	210D47'08"	100	27.53	3.72	26.87	25.00	4.00	0.40	right
23	Đ22	229D46'42"	100	46.4	10.24	43.44	25.00	4.00	0.40	right

No.	Crest	Angle A	R(m)	T(m)	P(m)	K/2(m)	ln(M)	I_{SC}(%)	W(M)	Direction
24	Đ23	185D56'55"	400	20.78	0.54	20.76	12.00	2.00	0.00	right
25	Đ24	145D57'45"	100	30.61	4.58	29.7	25.00	4.00	0.40	left
26	Đ25	196D12'31"	200	28.48	2.02	28.29	12.00	2.00	0.30	right
27	Đ26	208D12'42"	100	25.13	3.11	24.62	25.00	4.00	0.40	right
28	Đ27	160D33'41"	100	17.13	1.46	16.96	25.00	4.00	0.40	left
29	Đ28	161D11'49"	100	16.56	1.36	16.41	25.00	4.00	0.40	left
30	Đ29	170D14'20"	400	34.16	1.46	34.07	12.00	2.00	0.00	left
31	Đ30	194D30'28"	200	25.46	1.61	25.32	12.00	2.00	0.30	right
32	Đ31	173D31'20"	1000	56.59	1.6	56.53	0.00	0.00	0.00	left
33	Đ32	198D42'01"	200	32.93	2.69	32.64	12.00	2.00	0.30	right
34	Đ33	145D56'53"	100	30.62	4.58	29.72	25.00	4.00	0.40	left
35	Đ34	164D44'24"	300	40.19	2.68	39.95	12.00	2.00	0.00	left
36	Đ35	152D43'27"	100	24.26	2.9	23.8	25.00	4.00	0.40	left
37	CĐA									

Source: Description of Feasibility Study of the Project

Table 1-4: Design results of horizontal curve

No.	Radius	Alternative 1		Alternative 2	
		Crest	Rate (%)	Crest	Rate (%)
1	100≤R<200	9	25,00	6	28,13
2	200≤R<300	15	41,67	14	46,88
3	300≤R<400	1	2,78	1	3,13
4	400≤R<1.000	5	13,89	5	15,63
5	1.000≤R	5	13,89	6	15,63
6	Not driving bend	1	2,78		
Total		**36**	**100**	**32**	**100**

Source: Description of Feasibility Study of the Project

1.4.3.2. Road longitudinal section

Principles of design:

The road crosses area Km0 + 0.00 - Km2+158.39 which is frequently flooded in the rainy season. To ensure the harmony between the frequency of flooding and the current elevation of the residential areas along the road sides as well as the road investment policy, the red line elevation is designed according to the following basic principles:

- In accordance with the approved alignment planning (the drainage elevation in the administrative center area of Hoa Nhon is approved at 5% frequency with the lowest design elevation level H = 6.2m);

- Ensuring the design frequency;

- Trying to avoid affecting the residents along the road sides;

- Adhering to the control points: Hoang Van Thai road, the old National road 14B, Road 602, elevation level at bridges and culverts places;

- Ensuring drainage slope i>0.3%;

- Taking advantage of the old road base, ensuring the thickness of the new road surface structures;

- Longitudinal section is designed on contour method;

- The maximum longitudinal slope of 4%.

Table 1-5: Results of longitudinal control elevation

No.	Chainage	Position	Control elevation	Notes
1	Km0+00	Intersection with provincial road 604	8.13	Keep original status
2	Km0 - Km0+900	Hoa Nhon administrative center	> 6.20	According to planned elevation
3	Km4+859.72	Intersection with Hoang Van Thai road	9.70	Elevation of completed road
4	Km8+924.60	Intersection with provincial road 602	8.36	Keep original status
5	Small bridge, culverts on the road		Hydrology report on suitable level P 5%	
6	Flood level along the road		Hydrology report on suitable level P 5%	

Source: Description of Feasibility Study of the Project

1.4.3.3. Road horizontal section

The road horizontal section is selected as below:

+ Road surface : 2x5,25m, 2% horizontal slope.
+ Sidewalk : 2 x 5,0m = 10,0m, 2% horizontal slope 2%.

⇒ *Road base width: (5,0+10,5+5,0) = 20,5m.*

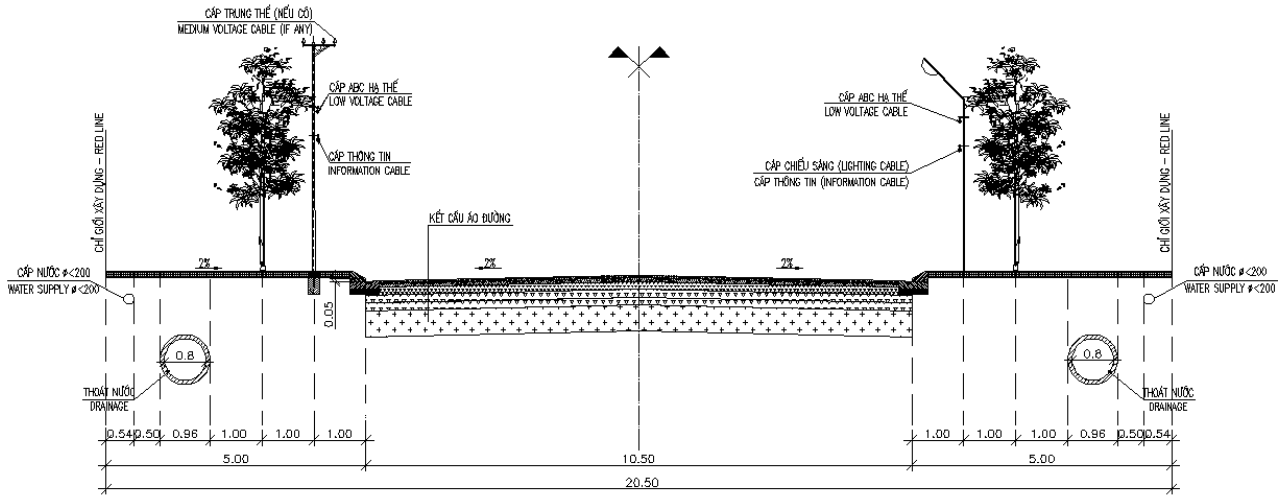


Figure 1-6: Cross section option for normal base

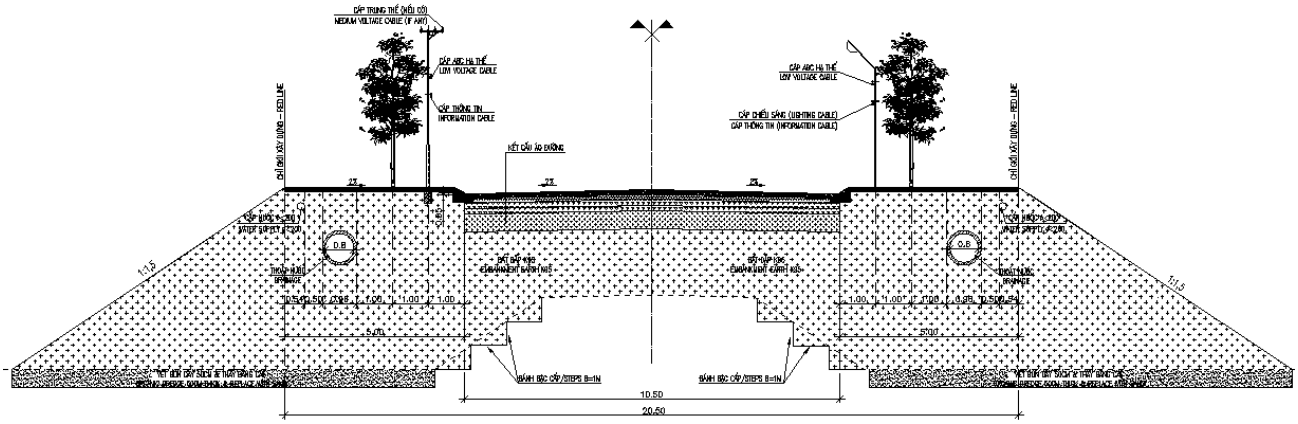


Figure 1-7: Cross section option for high filling base

1.4.3.4. Designing road base and protection

** Compaction:*

Road base is excavated with proper width, elevation and compaction K95, CBR >6. In particular, 30cm (excavated road base) and 50cm (backfilled road base) in the top near the road pavement layer, use hill soil with compaction of K98 to ensure load-bearing capacity CBR>8.

At sections crossing the rich fields, before backfilling road base, it is required to carry out organic dredging in thickness of 30cm or sludge dredging in thickness of 50cm. Slope of embankment >20%. Carry out benching before backfilling with $B_{benching}$ = 1.0m.

** Slope:*

Slope depends on the geological conditions of the road. For common embankment 1/m=1/1,5; excavation foundation in hill soil 1/m=1/1,0. Slope is planted with grass at the position near river and consolidated by concrete slab (40x40x5)cm, on reinforced concrete frame.

1.4.3.5. Designing of road pavement

Road pavement is designed according to the design procedures of soft road pavement with main street road in accordance with Standard 22TCN211-06, axis design load of 12 tons, wheel tracking diameter of D=36cm. Modulus of elasticity Eyc ≥155MPa. Top-down road pavement structure is as follows:

Reinforcing the old road surface to be made use of:

- Small size bitumen concrete BTNC12,5, thickness of 5cm;
- Spreading tack coat TC 0.5 kg/m2;
- Medium size bitumen concrete BTNC19, thickness of 7cm;
- Spreading tack coat TC 1.0 kg/m2;
- Crushed aggregate base course Dmax25, thickness of 15cm;
- Crushed aggregate base course Dmax37,5 thickness of 15cm;
- Warp supplement for crushed aggregate base course Dmax25.

Extended and new road surface:

- Small size bitumen concrete BTNC12.5 thickness of 5cm;
- Spreading tack coat TC 0.5 kg/m2;

- Medium size bitumen concrete BTNC19 thickness of 7cm;
- Spreading tack coat TC 1.0 kg/m2;
- Crushed aggregate base course Dmax25 thickness of 15cm;
- Crushed aggregate base course Dmax37.5 thickness of 15cm;
- Crushed aggregate base course Dmax37.5 thickness of 15cm;

1.4.3.6. Designing of auxiliary works

1) Sidewalk –Curb – Holes for planting trees

a) Sidewalk:

The sidewalk is excavated, filled with soil and compacted with K=0.95 to the designed elevation level, sidewalk surface is tiled with Darramic, thickness of 4cm, cement mortar M.75 thickness of 2.0cm, coarse sand underneath, compaction thickness of 5cm.

b) Curb:

Beveled structure 2/1, 20cm high, 25cm wide, upper structure M.250 stone 1x2 is installed from 1.0m long structure piece. Lower structure 60x20cm by concrete M.200 stone 1x2 poured in place on a padding layer thickness of 10cm. Side ditch width of 30cm, side ditch slope at 5%. Upper and lower structures are connected by cement M.100, thickness of 1.5cm.

c) Holes for planting trees – green trees:

Establish holes for planting trees with dimensions 1.0x1.0m, 50cm high along the road sides on the pavement, 1 hole each 8m. The holes are 1.0m far from the curb edge, holes structures are assembled by concrete M.250 stone 1x2.

Green trees: One of the following main tree type selected by the city: Yellow flame tree, Hopea odorata, Samanea saman...

d) Technical culverts:

Arrange technical culverts to deliver underground stuff, the positions to arrange the culverts depend on the infrastructure demand such as water supply, electricity supply, information optical fiber...

Assemble box culverts with dimensions (1.0x1.0m, 1.0m long by reinforced concrete M250 stone 1x2, culvert foundation padding is made by concrete M150 stone 2x4, under 10cm padding layer.

- Design result: 23 pieces/576 m.

2) Intersections, crossroads in residential areas

Design the intersections in a flat intersection form, speed at the intersection is 20km/h. Structure of the intersection surface is designed as the that of main road structure. The design range covers the connection range.

Design curb connection with curb radius ranging 5.0-12m, specifically:

- Crossing with road width 10.5m $\leq$ B : R_{min} = 12m;
- Crossing with road width 7.5m $\leq$ B<10.5 : R_{min} = 10m;
- Crossing with road width 5.5m $\leq$ B<7.5 : R_{min} = 8m;
- Crossing with road width 3.0m $\leq$ B <5.5m: R_{min} = 5m;

Residential area crossroads having width B < 3m are connected to the pavement.

Residential area crossroads having elevation level different from the main road elevation level shall be designed with vertical slope $i_{max} \leq 4\%$. Structures restored:

* Cement concrete roads:

+ Cement concrete M200 thickness of 18cm;

+ Oil paper;

+ Crushed aggregate base course Dmax25 thickness of 10cm.

* Asphalt concrete road:

+ BTNC15 thickness of 5cm;

+ Spreading tack coat TC 0.5 kg/m2;

+ Crushed aggregate base course Dmax25 thickness of 15cm.

3) Bus stops

36 bus stops will be constructed on the DH2 road. Bus stops are designed as stop-pass with extra lane; approximately 300-700m arranged a stop point, structures as of the main road.

4) Traffic safety system

Organizing traffic flow on road with a system of road signs: signboards, line marking following the current road signing regulations (Road sign charter 22 TCN 237-01).

5) Environmental sanitation

Planting appropriate trees on the sidewalk which help reduces noise, dust and provide cooling for pedestrians. Along each 8m plant a tree, plant on both road sides.

Arrange recycle bins along the sidewalk every 50m. The shape and size of the recycle bin should be aesthetic and suitable for the road.

6) Other infrastructures

Other infrastructures: Power supply, water supply, lighting, cable and communication systems shall be provided in accordance with branch standard and made into separated documents.

7) Drainage works

a) Design principles:

On drainage: This is the urban road, hence gathering water into one area is necessary. Depending on the basin, arrange suitable water gathering locations;

On aperture: Combining the aperture of the existing bridges and culverts on Hai Van - Tuy Loan road and the drains through the main channel of Tuy Loan pumping station to establish drainage for the basins;

The horizontal drainage system is calculated in accordance with the standard for typical flood features (22 TCN 220-95 standard). Design frequency P = 5%;

The irrigation drains, intake culverts of the pumping station are applied restoration design;

The vertical drainage system is calculated following the MOT's manual for Hydrology and Hydraulics of Bridges and roads.

b) Vertical drainage

Vertical drainage is arranged on the sidewalk, the center of the drainage system is 2.5m

from the road surface edge. Centrifugal concrete pipes D = 800 are used, putting on crushed course stone 4x6 with thickness of 30cm; Manholes, inlets and horizontal raceways arranged at intervals of 25m, concrete structures M150 with M200 reinforced concrete cover. At the horizontal locations, arrange centrifuge bearing pipe.

Vertical drainage is connected to bridges, outlets to Tuy Loan river.

At the segments invested in different stages, ditches along the excavated base are reinforced by concrete pieces with dimensions 57x50x8 cm.

Restore irrigation ditches with soil-filling structure K95, trapezoid shaped (5+1)x1m, roof slope 1:2.

c) Horizontal drainage

- Design policy : new design;
- Scale : permanent;
- Calculated load : HL93, H30-XB80;
- Bridge, culvert width is equal to road base width.

**** Box culverts:***

The drains on the road are designed to use box culverts with aperture from 100x100 cm to 300x300 cm

- Culvert body: Reinforced concrete M300 stone 1x2, culvert body cutoff is made by concrete M200 stone 1x2.

- Upstream, downstream: Head wall, side wall with reinforced concrete M300 stone 1x2, cutoff culvert ground by concrete M150 stone 2x4 on padding layer thickness of 10cm. Reinforcement against erosion for the upstream and downstream by rip rap.

- Load reduction slabs: by reinforced concrete M200 stone 1x2, manholes of the vertical drainage by concrete M150 with reinforced concrete M200 slab cover.

+ Box culvert (100x100)cm : 13/606.5 (piece/meter long);
+ Box culvert (150x150)cm : 6/144 (piece/meter long);
+ Box culvert 2x(150x150)cm : 1/22 (piece/meter long);
+ Box culvert (200x200)cm : 2/62 (piece/meter long);
+ Box culvert 2x(300x200)cm : 1/23 (piece/meter long);
+ Box culvert (300x300)cm : 5/118 (piece/meter long);

Table 1-6: Summary of horizontal drainage culverts

TT NO.	LÝ TRÌNH STATION	HIỆN TRẠNG/EXISTING			THIẾT KẾ/ DESIGN	
		LOẠI CỐNG CULVERT TYPE	KHẨU ĐỘ APERTURE	CHIỀU DÀI (M) LENGTH	KHẨU ĐỘ DIMENSION	CHIỀU DÀI (M) LENGTH
1	KM0+94.99	Cống hộp BTCT/RC box culvert	V(200x200)cm	8.00	CỐNG HỘP/BOX CULVERT (200X200)CM	40.00
2	KM0+440.00	Cầu dầm bản BTCT/RC slab beam bridge	6m	6.50	CỐNG HỘP/BOX CULVERT (300X300)CM	24.00
3	KM0+620.00	Cống tròn BTCT/RC pipe culvert	D100cm		CỐNG HỘP/BOX CULVERT (100X100)CM	24.00
4	KM0+926.62	Cống tròn BTCT/RC pipe culvert	2D100cm	9.35	CỐNG HỘP/BOX CULVERT (300X300)CM	24.00
5	KM1+354.20	Cống tròn BTCT/RC pipe culvert	D100cm	8.20	CỐNG HỘP/BOX CULVERT (100X100)CM	24.00
6	KM1+540.00	Cống tròn BTCT/RC pipe culvert			CỐNG HỘP/BOX CULVERT (100X100)CM	27.00
7	KM1+680.00				CỐNG HỘP/BOX CULVERT (100X100)CM	20.50
8	KM2+489.56	Cống tròn BTCT/RC pipe culvert	D100cm	7.50	CỐNG HỘP/BOX CULVERT (100X100)CM	28.00
9	KM2+732.73	Cống tròn BTCT/RC pipe culvert	D150cm	7.78	CỐNG HỘP/BOX CULVERT (150X150)CM	27.00
10	KM2+813.72	Cống tròn BTCT/RC pipe culvert	D150cm	9.04	CỐNG HỘP/BOX CULVERT (300X300)CM	25.00
11	KM2+951.71	Cống tròn BTCT/RC pipe culvert	D150cm	7.50	CỐNG HỘP/BOX CULVERT (150X150)CM	26.00
12	KM3+066.70	Cống tròn BTCT/RC pipe culvert	D150cm	7.50	CỐNG HỘP/BOX CULVERT (150X150)CM	24.00
13	KM3+296.42	Cống tròn BTCT/RC pipe culvert	D150cm	8.15	CỐNG HỘP/BOX CULVERT (100X100)CM	27.00
14	KM4+022.91	Cống tròn BTCT/RC pipe culvert	D100cm		CỐNG HỘP/BOX CULVERT (100X100)CM	22.00
15	KM4+106.27	Cống tròn BTCT/RC pipe culvert	D100cm	8.15	CỐNG HỘP/BOX CULVERT (200X200)CM	22.00
16	KM4+196.16	Cống tròn BTCT/RC pipe culvert	D75		CỐNG HỘP/BOX CULVERT (100X100)CM	22.00
17	KM4+912.51	Cống tròn BTCT/RC pipe culvert	D100cm	14.20	CỐNG HỘP/BOX CULVERT 2(150X150)CM	22.00
18	KM5+218.69	Cống tròn BTCT/RC pipe culvert	D100cm	7.85	CỐNG HỘP/BOX CULVERT (100X100)CM	22.00
19	KM5+458.86	Cống tròn BTCT/RC pipe culvert	2D100cm	9.75	CỐNG HỘP/BOX CULVERT (150X150)CM	22.00
20	KM5+690.84	Cầu dầm bản BTCT/RC slab beam bridge	6m	8.00	CỐNG HỘP/BOX CULVERT 2(300X200)CM	23.00
21	KM6+064.05				CỐNG HỘP/BOX CULVERT (100X100)CM	23.00
22	KM6+256.35				CỐNG HỘP/BOX CULVERT (100X100)CM	23.00
23	KM7+059.52	Cống tròn BTCT/RC pipe culvert	D100cm	6.82	CỐNG HỘP/BOX CULVERT (150X150)CM	23.00
24	KM7+400.00	Cống tròn BTCT/RC pipe culvert	3m	8.50	CỐNG HỘP/BOX CULVERT (300X300)CM	23.00
25	KM8+095.37	Cống tròn BTCT/RC pipe culvert	2D100cm	8.15	CỐNG HỘP/BOX CULVERT (150X150)CM	22.00
26	KM8+321.67				CỐNG HỘP/BOX CULVERT (100X100)CM	22.00
27	KM8+649.48				CỐNG HỘP/BOX CULVERT (100X100)CM	22.00
28	KM8+900.00	Cầu dầm bản BTCT/RC slab beam bridge	4m	5.5	CỐNG HỘP/BOX CULVERT (300X300)CM	22.00

Table 1-7: Summary of horizontal culverts returning two old road sections (adjusted section)

TT NO.	LÝ TRÌNH STATION	HIỆN TRẠNG/EXISTING			THIẾT KẾ/ DESIGN	
		LOẠI CỐNG CULVERT TYPE	KHẨU ĐỘ APERTURE	CHIỀU DÀI (M) LENGTH	KHẨU ĐỘ DIMENSION	CHIỀU DÀI (M) LENGTH
1	KM0+435.11	Cầu dầm bản BTCT/RC slab beam bridge	6m	6.50	CỐNG HỘP/BOX CULVERT (300X300)CM	15.50
2	KM0+530.15	Cống tròn BTCT/RC pipe culvert	D100cm		CỐNG HỘP/BOX CULVERT (100X100)CM	15.50
3	KM0+712.00	Cống tròn BTCT/RC pipe culvert	D100cm		CỐNG HỘP/BOX CULVERT (100X100)CM	15.50
4	KM1+751.12	Cống tròn BTCT/RC pipe culvert	2D100cm	9.35	CỐNG HỘP/BOX CULVERT (100X100)CM	15.50
5	KM1+867.92	Cống tròn BTCT/RC pipe culvert	D100cm	8.20	CỐNG HỘP/BOX CULVERT (100X100)CM	15.50
6	KM2+050.44				CỐNG HỘP/BOX CULVERT (100X100)CM	15.50

**** Bridges: 4 bridges are built on the DH2 road. Their location and structure are described as follow:***

Bridge at Km0+165,99:

- Upper part structures: Total bridge length Ltc=9.0m, bridge span (1x6)m, reinforced concrete slab beams of 30Mpa. There are 20 slab beams with thickness of 30cm. Bridge deck is coated with tight asphalt BTNC12.5, thickness of 5cm. Handrails by reinforced concrete 25Mpa;

- Lower part structures: Use flexible abutment structure, crosshead by reinforced concrete 25Mpa placed directly on a line of piles, arrange 20 piles each abutment, estimated length of pile Ldk=19m, pile section 35x35cm by reinforced concrete 30Mpa. Behind each abutment, arrange slab 200x300x20 cm by reinforced concrete 20Mpa. Retaining wall by reinforced concrete 15Mpa.

- Road on both bridge ends: following the general standard for the whole road. Reinforcing 10m road on the bridge end with mortared rip rap M100, thickness of 25cm

Bridge at Km2+368,43:

- Upper part structures: Total bridge length Ltc=21.78m, bridge span (1x9)m, reinforced concrete beams slab of 30Mpa. There are 20 slab beams with thickness of 45cm. Bridge deck is coated with tight asphalt concrete 12.5, thickness of 5cm. Handrails by reinforced concrete 25Mpa;

- Lower part structures: Use flexible abutment structure, crosshead by reinforced concrete 25Mpa placed directly on a line of piles, arrange 20 piles each abutment, estimated length of pile Ldk=12m, pile section 35x35cm by reinforced concrete 30Mpa. Behind each abutment, arrange slab 200x300x20 cm by reinforced concrete 20Mpa. Slope protection by mortared rip rap M100, thickness of 25cm

- Road on both bridge ends**:** following the general standard for the whole road. Reinforcing 10m road on the bridge end with mortared rip rap M100, thickness of 25cm.

Bridge Km6+623,18 (Lau Qua bridge):

- Upper part structures: Total bridge length Ltc=21.78m, bridge span (1x9)m, reinforced concrete beams slab of 30Mpa. There are 20 slab beams with thickness of 45cm. Bridge deck is coated with tight asphalt concrete 12.5, thickness of 5cm. Handrails by reinforced concrete 25Mpa;

- Lower part structures: Abutment is wall structured, cap is reinforced concrete 25Mpa. Shallow foundation of 1.5m thickness is reinforced concrete 15Mpa. Behind each abutment, arrange slab (200x300x20)cm by reinforced concrete 20Mpa. Quarter cones by mortared rip rap M100, thickness of 25cm.

- Road on both bridge ends**:** following the general standard for the whole road. Reinforcing 10m road on the bridge end with mortared rip rap M100, thickness of 25cm. Building the bypass to ensure the construction on the right of road.

Designing results of the reinforced concrete slab bridge: 4/676.5 (pcs/m^2).

8) Relocation of medium and low-voltage transmission line and newly building of lighting system:

a) Purpose:

- Relocate electric poles will affect the construction of road items.
- Newly building public lighting system for completely-invested sections.

b) Scope:

Since the road DH2 Hoa Nhon – Hoa Son is newly upgraded and improved, the new medium and low-voltage transmission lines, transformer substation and the existing lighting systems should be dismantled and relocated to the position at the newly-planned sidewalk. At the same time, it is required to withdraw the existing lighting systems and newly build lighting systems suitably with the landscape of the road.

- Transmission lines to be dismantled:

+ Floating medium-voltage transmission line 22kV : 8,789m.

+ Floating low-voltage transmission line 0.4kV : 8,504 m.

+ Transformer substations : 08 substations.

- Transmission lines after relocation: (is built as new)

+ Medium-voltage transmission line 22kV after relocation : 9.219 m.

+ Floating low-voltage transmission line after relocation : 14.749,6 m.

+ Floating transmission line to be newly built : 10.087,5m.

+ High-voltage lamp 150W-220V : 22 sets.

+ High-voltage lamp 250W-220V : 206 sets.

+ Transformer substation : 08 substations.

Medium and low-voltage transmission lines systems, transformers substation and existing lighting system should be dismantled and relocated to the position at the newly-planned sidewalk. It is required to withdraw the existing lighting systems and and newly build lighting systems suitably with the landscape of the road.

c) Technical solutions

** Medium-voltage route:*

- Transmission line: Currently, there is floating medium-voltage transmission line along one side of the road.

+ The floating medium-voltage transmission line on centrifugal concrete pillars of 10.5m, 14m, and H10 pillars.

+ The existing transmission line consists of various kinds of cables AC50, AC70, AC95, AC240, AV95-24KV, AV120-24KV.

+ Newly building of centrifugal concrete pillar of 14m for the medium-voltage transmission line after relocation, making use of iron pillars of 10.7m.

- Dismantle, make use of and supplement various kinds of cables AC50, AC70, AC95, AC240, AV95-24KV, AV120-24KV for the medium-voltage transmission line after relocation.

Insulation and transmission line fittings:

- Make use of types of insulation for the medium-voltage transmission line and supplement at required positions.

- Transmission line fittings: Using domestic fittings.

Pillars:

- Make use of 10.7m pylon pillars dismantled for the medium-voltage substation and pillar after relocation.

- Newly building of centrifugal concrete pillars of 14A, 14C.

- Newly-grown pillars are purchased from the concrete plants, then transported to the construction site.

Beams:

- Make use of types of beams dismantled and supplement for re-installing for the medium-voltage transmission line after relocation.

- For newly-built beams, use form steel manufactured at factory and hot dip galvanized with minimum thickness of 80μm.

Pier foundation:

The whole route uses cast-in-place pier foundation, kind of stepped foundation. There are 4 kinds of foundation, including MT3, MT4 and centrifugal twin pier foundation and 10.7m iron pier foundation.

- Foundation MT3: Used for centrifugal concrete pillars 14A at the vertical supporting positions.

- Foundation MT4: Used for centrifugal concrete 14C at corners, branched and head/end positions.

- Twin pier foundation is used at position of placing 2 centrifugal concrete pillars of 14m.

- Iron pier foundation is used at positions of 10.7m iron pillars

Protection:

- Medium-voltage side: Atmosphere over-voltage protection by valve lightning arrester 22kV, symbol LA-22 (make use of).

- Protect transmission line and human by multiple earthing. Earthing by 6 steel piers L63x63x6 vertically driven beneath ground, LR-6 earthing kind. Earthing resistance ≤ 30Ω.

Low-voltage line:

- Transmission line: Currently, there is floating low-voltage transmission line in combination with floating medium-voltage transmission line along two sides of the road.

+ The floating low-voltage transmission line on centrifugal concrete pillars of 10.5m, 8.4m, 7.2m and H7 pillar.

+ The existing conductor wire consists of kinds of cables: ABC(4x35)XLPE-0,6KV, ABC(4x50)XLPE-0,6KV, ABC(4x70)XLPE-0,6KV, ABC(4x95)XLPE-0,6KV, ABC(4x120)XLPE-0,6KV, AV95-0,6KV, AV50-0,6KV.

+ The low-voltage transmission line after relocation runs floating in two sides of sidewalk for the road bed with cross section of 10.5m and runs floating on one side of sidewalk for the road bed with cross section of 7.5m. Low-voltage transmission line runs floating in combination with the medium-voltage transmission line after relocation and runs floating independently on the centrifugal concrete pillar of 8.4m.

- Dismantling and making use of all aerial bundled cables ABC(4x35)XLPE-0,6KV, ABC(4x50)XLPE-0,6KV, ABC(4x70)XLPE-0,6KV, ABC(4x95)XLPE-0,6KV, ABC(4x120)XLPE-0,6KV, AV95, AV50 and supplement kinds of cables suitable for low-voltage transmission line after relocation.

- Make use of haulage cables to hauling to households and supplement insufficient sections.

Pier:

- Newly-building of centrifugal concrete piers of 8,4A & 8,4C.

- Newly-grown piers are purchased at the concrete plants, then transported to the construction site.

Pier foundation:

- The whole route uses cast-in-place pier foundation, kind of stepped foundation. There are 3 kinds of foundation, including MT1, MT2 and centrifugal concrete twin pier foundation of 8.4m.

Insulation and transmission line fittings:

- Using dedicated equipment for hanging cable: At cable support positions, using cable suspension clamp. At the end position and corner, using cable tightening clamp.

Conduit box:

- At each low-voltage and medium-voltage pier, arrange conduit box to return supply grid for sub-loading households. Conduit box is installed into pier by steel strapping and lock.

Protection:

- To ensure safety for operating on low-voltage lines, using earthing joints for connecting to earthings of the medium-voltage transmission line after relocation.

- Short-circuit and overload protection for wire by general and branch circuit-breakers placed in the cabinet of the substation.

Lighting line:

- Line:

+ Dismantle the existing lighting line and newly install one for the road.

+ Lighting line is newly installed floating on medium and low-voltage piers after relocation.

+ Newly install aerial bundled cable ABC(4x35)-XLPE/0,6KV for newly-installed line to ensure lighting and aesthetic of the newly-planned road.

Lighting technical indexes:

- According to lighting standards: For grade B road (road bed width of 10.5m), the lighting system should pass following basic parameters:

+ Average brightness : 0.8 – 1.6cd/m^2;

+ Average illumination : 10 - 25Lux ;

+ Overall uniformity Uo : $\geq$ 40 %;

+ Longitudinal uniformity Ul : $\geq$ 70 %;

- According to lighting standards: For grade C road (road bed width of 7.5m), the lighting system should pass following basic parameters:

+ Average brightness : 0.4 – 0.6cd/m^2;

+ Average illumination : 10 - 25Lux ;

+ Overall uniformity Uo : $\geq$ 40 %;

+ Longitudinal uniformity Ul : ≥ 70 %.

Arrangement of clamp on piers:

- The whole lighting line runs floating on piers of medium and low-voltage transmission line after relocation and arranged with lighting on one side.

+ Lamp mounting height is 9.5m for road bed with cross section of 10.5m.

+ Lamp mounting height is 8.2m for road bed with cross section of 7.5m.

+ Using type of high-voltage Sodium lamp 250W-220V for road bed with cross section of 10.5m and Sodium lamp 150W-220V for road bed with cross section of 7.5m.

+ Illumination angle is 10^o.

+ For the lighting line combined on medium-voltage pier, using 1.5m lamp rod and mounted on medium-voltage pier by beam clamp.

+ For the lighting line running on centrifugal concrete pier of 8.4m, using lamp rod cap of 1.5m.

Power supply methods:

- Power supply source:

+ Power supply source for lighting cabinets is taken from the low-voltage line after relocation to supply power for the newly-built lighting system.

- Grid structure:

+ Using 3-phase 4-wire network.

+ Rated voltage: 220/380V.

Main features:

- Whole lighting line runs floating.

- Using aerial bundled cable ABC(4x35)/XLPE-0,6kV.

- Lamp cable M(2x2,5)PVC/PVC-0,6kV.

Control system:

- Lighting system is controlled by the control regime of newly-installed lighting cabinet.

- On-off control time follows Decision No. 16/QD-UBND dated 12 April 2012 of the Danang city People's Committee.

Safety:

- Short-circuit protection for general feeder and lighting lines by available circuit breaker installed in the lighting cabinet.

- High-pressure lamps are locally protected by fuse 5A which is newly-installed at each pier.

Earthing:

- To project neutral wire and safety for people along the lighting line, earthing is connected commonly into the earthing system of the medium and low-voltage transmission line after relocation.

Transformer substation:

- Dismantling and relocation of substation. Of which:

+ Two 3-phase substations 100kVA-22/0,4kV.

+ Four 3-phase substations 180kVA-22/0,4kV.

+ Two 3-phase substations 250kVA-22/0,4kV.

- Make use of all equipment and materials of substations after relocation, including transformers, cabinets, insulator, beams, arrester and fuse cut out, etc.

- Replace necessary fittings.

- Newly build earthing system for each substation.

9) Treatment of intersection with high-voltage transmission line

At intersections with the high-voltage transmission line, it is required to ensure clearance.

Pursuant to the Government's Decree No.14/2014/ND-CP dated 26 February 2014 stipulating in detail of Electricity Law regarding electricity safety: The discharge safety distances for different voltages is minimum distance from conductor in the maximum sagging state to the highest point of the protected object and prescribed in the table below:

Voltage / Discharge safety distances	Up to 35kV	66-110kV	220kV	500kV
To highest point of highway means of transport	2.5 m	2.5 m	3.5 m	5.5 m

Item (c), Article 6 of Circular No. 39/2011/TT-BGTVT dated 18 May 2011 regulating and instructing the implementation of the Government's Decree No.11/2010/ND-CP on management and protection of road traffic infrastructure as follow: For the transmission line runs above the road, it is required to ensure that minimum distance according to the vertical direction from the lowest point of the transmission line in the maximum sagging state to the highest point of road pavement (excluding backup section for lifting road pavement when repairing, upgrading and improvement) is 4.75m plus discharge safety distance for different voltages in accordance with laws on electricity.

10) Relocation of water supply system

Water sources:

Water source is unchanged, continue to be taken from D280 HDPE line on the provincial road 602.

Network:

The existing pipelines D110, D50 along the road have just been invested since 2014. These pipelines are now operating well and ensure demands of water use. However, when the road is upgraded, these pipelines are mostly located beneath road bed or in line with the drainage culvert and other infrastructures. Regarding economic efficiency, to avoid waste and ensure continued supply water for residents, the consultant proposes to relocate the existing pipelines to the appropriate positions on sidewalk.

The relocation should be calculated thoroughly to reduce time of water failure. In doing so, it is required to relocate section by section and complete on daily basis. On average, it should be relocated and returned about 50-100m daily. At each section, it is required to availably dig ditch on sidewalk and on road bed, then cut pipe for relocating, then re-connect existing pipe, flush and combine the relocation and return the gauge assembly on such section. Relocation of 1,925m of D110 HDPE pipe and 2,887.5m of D50 HDPE pipe.

At the position of D50 HDPE pipe crossing the road, pipe (3*5m) will be connected additionally with pipe burying depth 0.8m from road pavement and steel bush D100 (3*8m).

Re-connect the conduits into branch alley.

Newly install residual valve at the end of road.

11) Return existing road

The sections at 2 positions with adjusted alignment will be updated and renovated to ensure smooth connection with the main road and facilitate the travelling of residents in two existing sections. The road is designed to follow the existing road to minimize the site clearance compensation.

Scale:

- Scale and grade : Collector road;
- Design speed : 40Km/h;
- Design frequency : Follow the existing road and ensure annual flood frequency
- Length :1,073.93m; Of which:
  - + Section 1 : 431.27m;
  - + Section 2 : 642.66m;
- Cross section : Bn=(4.0+7.5+4.0)= 15.5m;
- Road pavement structure grade A1 with Eyc ≥ 120Mpa;
- Technical infrastructure on road: Curb, sidewalk and green trees which are invested synchronously.
- Longitudinal drainage : Using centrifugal concrete pipe with aperture of F600;
- Traffic safety: Complete investment;

Relocate medium and low-voltage transmission line and newly build the lighting system.

1.4.3.7. Volume of excavated and backfilling soil during the construction (according to the option)

According to the basic design of the Project, volume of soil to be excavated, backfilled and transported during the construction of road items is shown in the table below:

Table 1-8: Volume of excavated and backfilling soil during the construction of work items

No.	Items	Excavated soil (m^3)	Backfilling soil (m^3)
I	***Road base***		
1	Excavation of grade 3 soil road base	99.679,74	-
2	Excavation of grade 3 soil road form	24.429,67	-
3	Volume of organic sludge	18.583,87	-

No.	Items	Excavated soil (m^3)	Backfilling soil (m^3)
	dredging		
4	Volume of benching	1.792,25	-
5	Excavation of old road pavement	2.714,41	-
6	Road base backfilling K95	-	304.788,02
7	Road base compaction K95, thickness of 30cm	-	39.658,55
8	Coarse sand filling to set off sludge dredging	-	3.895,58
9	Hill soil compaction ≥ K98	-	37.518,31
II	***Bus stop***		
	Hill soil compaction ≥ K98	-	1.890
III	***Longitudinal drainage system***		
10	Returning irrigation ditch	372,76	2.140,85
IV	***Site clearance compensation***		
11	Backfilling due to elevation difference	-	8.212,50
	Total	**147.572,70**	**398.103,79**

Source: Summary from the Description of Basic Design of the Project

1.4.3.8. Forecasting traffic demands on the road DH2

The results of forecasting traffic flow for each phase of the road DH2 are shown in the table below:

Table 1-9: Forecasting results of traffic flow on the road DH2

	Year 2016						
	Loại PT/Veh Type	xe đạp + xe máy	xe con / Car	xe bus/ BUS	xe tải Truck	Total Vehicle/ Tổng xe	Total PCU/ Tổng PCU
Section	Đầu tuyến	8,161	84	-	461	8,706	2,869
	Cuối tuyến	8,529	217	98	1,138	9,982	5,013
	Năm 2020						
	Loại PT	xe đạp + xe máy	xe con / Car	xe bus/ BUS	xe tải Truck	Total Vehicle/ Tổng xe	Total PCU/ Tổng PCU
Section	Đầu tuyến	8,458	105	-	510	9,073	3,072
	Cuối tuyến	8,839	271	155	1,258	10,523	5,573
	Year 2025						
	L(Means of transport	xe đạp + xe máy	xe con / Car	xe bus/ BUS	xe tải Truck	Total Vehicle/ Tổng xe	Total PCU/ Tổng PCU
Section	Đầu tuyến	10,634	150	-	672	11,456	3,957
	Cuối tuyến	11,114	386	247	1,658	13,405	7,371
	Year 2030						
	Loại PT	xe đạp + xe máy	xe con / Car	xe bus/ BUS	xe tải Truck	Total Vehicle/ Tổng xe	Total PCU/ Tổng PCU
Section	Đầu tuyến	11,109	202	-	806	12,117	4,439
	Cuối tuyến	11,610	521	322	1,989	14,442	8,621

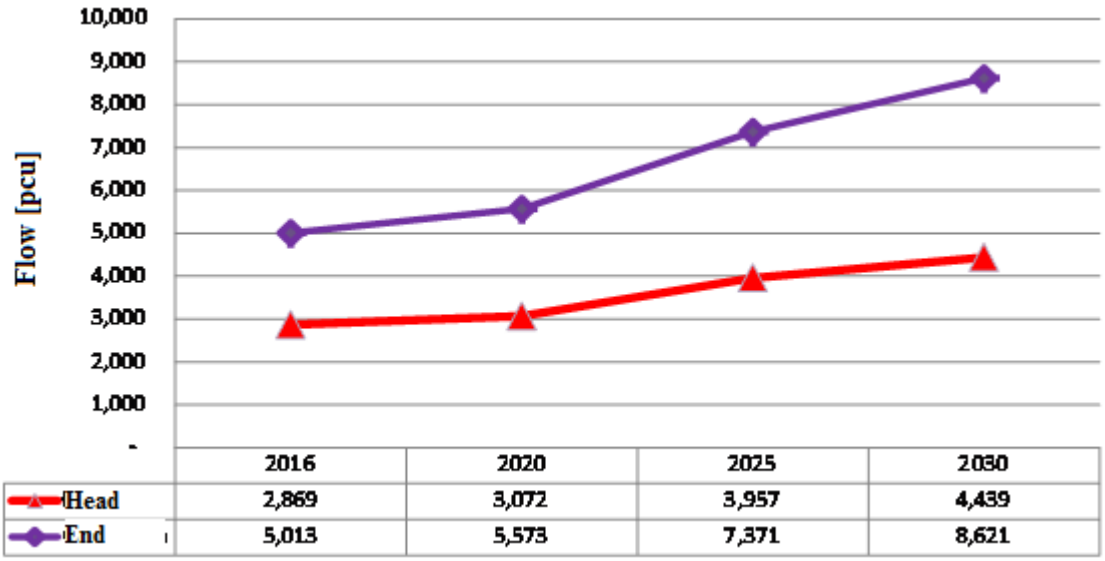


Figure 1-8: Forecasting traffic flow on the road DH2

1.4.4. Construction organization of the Project

1.4.4.1. Mobilization of manpower and machines

The personnel serving the project will be recruited and trained by the contractors to ensure sufficient capacity to perform the tasks. In bids, construction contractors will also present their personnel mobilization plans, including the priority in using local laborers.

Machinery and equipment for the project will also be proposed by the construction contractors and approved by the PMU to ensure construction requirements for the components of the project to be met and in line with general progress.

Table 1-10: Indicative list of machines and equipment for construction

No.	Name of machines and equipment for construction
1	Truck of 2.5 – 7 tons
2	Bitumen sprayer of 7 tons
3	Water tanker of 5-9m3
4	Dump truck of 10 tons
5	Self-propelled vibrator of 25 tons
6	Wheel-mounted crane of 25 tons
7	Excavator of 1.25m3
8	Self-propelled wheel-mounted vibrator of 16 tons
9	Plate compactor of 1kW
10	Portable iron cutter of 1.0kW
11	Electric welder of 23kW
12	Vibrating roller of 10-25 tons
13	Grinder of 1.0kW
14	Diesel powered air compressor of 600m^3/h
15	Bulldozer of 108CV
16	Spreader of 50-60m^3/h
17	Grader of 108CV
18	Concrete mixer of 250l
19	Hoist of 0,8T
20	Excavator of 1,6m3
21	Bitumen boiler
22	Line painter
23	Concrete batching plant of 60 tons/h

1.4.4.2. Supply sources of materials and stockpiles

According to the basic design of the Design Consulting Unit, main materials mines which can be used for the construction of the project are listed as below. All material supply

mines and waste stockpiles are granted with licenses:

1) Filling soil materials

According to basic design of the project, Hoa Nhon land mine is chosen as the main fill soil supply mine for the project because the mine is located on the old QL14B road intersecting with the start point of the route at Giang Bridge, convenient to the transportation of materials to the work construction.

Hoa Nhon land mines

- Hoa Nhon land mine, located on National road 14B, average transport distance of 8.0Km;
- Reserve of 90.000m3/year, quality guaranteed for work construction.

In the providing case, it is possible to exploit from the following mines:

a) Phuoc Thuan land mine (DD1)

- Location: The mine is in Hoa Nhon commune - Hoa Vang district - Danang city, and is currently exploited and managed by the Asphalt and construction stone exploitation enterprise under Danang Transport construction company.

- Conditions of exploitation and delivery: The mine is exploited by machine, conditions of exploitation and delivery are favorable and not affected by weather. Transport distance to the end of project is about 5.3km (of which 2.2 km of 5.0 wide asphalt road, 1.0km of 10.5m asphalt road, 2.1km of asphalt Road 14B).

- Reserve: The reserve of the mine is about 800,000m^3. (evaluated as Grade C reserves, not affecting the environment).

- Quality: According to the test results of 01 soil sample taken at the mine, the soil here is a kind of clay mixed with sand and gray yellow reddish brown soil. Some average physical and mechanical features of the mine are as follows:

+ Natural moisture:	W	= 14.85 %
+ Best moisture:	Wtn	= 14.02 %
+ Maximum dry density volume:	γcmax	= 1.897 g/cm^3
+ Plasticity:	Ip	= 10.60 %
+ CBR:	CBR 100%	= 10.50
+ CBR 98% = 9.40		
+ CBR 95% = 7.60		

b) Hoc Gia Hanh land mine (DD2)

- Location: The mine is in the area of Tung Son village, Hoa Nhon commune - Hoa Vang district - Danang city and is currently exploited and managed by Quang Hung Limited Liability company (Danang).

- Conditions of exploitation and delivery: The mine is exploited by machine, conditions of exploitation and delivery are favorable and not affected by weather. Transport distance of about 8.7km (of which 0.7km of 4.0 wide earth road; 0.4km of 5.0m asphalt road; 6.0km of Hai Van - Tuy Loan asphalt road; 1.6Km of asphalt National road 14B.

- Reserve: The reserve of the mine is about 700,000m^3. (evaluated as Grade C reserves, not affecting the environment).

- Quality: According to the test results of 01 soil sample taken at the mine, the soil here is a kind of clay mixed with sand and gray yellow reddish brown soil. Some average physical and mechanical features of the mine are as follows:

+ Natural moisture:	W	= 15.02 %
+ Best moisture:	Wtn	= 14.77 %
+ Maximum dry density volume:	γcmax	= 1.884 g/cm^3
+ Plasticity:	Ip	= 11.1 %
+ CBR:	CBR 100%	= 9.70

+ CBR 98% = 8.80

+ CBR 95% = 7.20

c) Hai Yen land mine (DD3):

- Location: The mine is in Hoa Son commune - Hoa Vang district - Danang city and is currently exploited and managed by Hai Yen private company.

- Conditions of exploitation and delivery: The mine is exploited by machine, conditions of exploitation and delivery are favorable and not affected by weather. The average transport distance of about 6.7 km.

- Reserve: about 1,000,000m^3.

- Quality: the soil here is a kind of clay mixed with sand and gray yellow reddish brown soil.

d) Truong Ban land mine (DD4):

- Location: The mine is in Hoa Son commune - Hoa Vang district - Danang city and is currently exploited and managed by Truong Ban Construction Limited Liability company. The average transport distance of about 6.4 km

- Conditions of exploitation and delivery: favorable and not affected by weather.

- Reserve: about 800,000m^3.

- Quality: the soil here is a kind of clay mixed with sand and gray yellow reddish brown soil.

2) Sand materials

- The sand supply source for construction can be obtained from the mines located along Tuy Loan river, average transport distance of 5.5Km;

- The reserve of each mine is about 200m^3/day, quality guaranteed for work construction.

In backup cases, the following mines can be used:

a) Do bridge sand collection site (C1)

- Location: The collection site is located on the left of Do bridge in the area of Hoa Chau commune - Hoa Vang district - Danang city and is managed by Le Van private base.

- Conditions of exploitation and delivery: exploited by machine, conditions of exploitation and delivery are favorable in the dry season and unfordable in the rainy season. Transport distance from the collection site to the project area is about 5.10km, of which 4.90km of asphalt Road 1A and 0.2km of earth road.

- Supply capacity: The survey shows that the supply capacity of the collection site is

not stable and depending on weather and supplies from small exploitation sites; the site provides average 300 m^3/day

- Quality: According to the experimental result, the sand here is of good quality, coarse medium-grained sand that is good for concreting. Grain size modulus: M = 2.69.

b) Qua Giang bridge sand collection site (C2)

- Location: The collection site is located on the left of Qua Giang bridge in Hoa Phuoc commune - Hoa Vang district - Danang city and is currently managed by Tran Thi Hoa private base.

- Conditions of exploitation and delivery: exploited by machine, conditions of exploitation and delivery are favorable in the dry season and unfavorable in the rainy season. Transport distance from the collection site to the project area is about 0.8km (of which about 700m of asphalt Road 1A and 100m of earth road).

- Supply capacity: The survey shows that the supply capacity of the collection site is about 100m^3/day.

- Quality: According to the experimental result, the sand here is of good quality, coarse medium-grained sand that is good for concreting. Grain size modulus: M = 2,65.

c) Tuy Loan sand collection site (C3)

-Location: The collection site is located on the right of Giang bridge in Hoa Nhon commune - Hoa Vang district and is currently managed by Nguyen Thi Nhut private base.

- Conditions of exploitation and delivery: exploited by machine, conditions of exploitation and delivery are favorable in the dry season and unfavorable in the rainy season.

- Supply capacity: unstable, depending on weather and small exploitation sites in the upstream area of Thu Bon river, the site provides average 100 m^3/day.

- Quality: good, the sand is of coarse medium-grain that is good for concreting.

d) Tuyen Son bridge sand collection site (C4)

- Location: The collection site is located on the left side of Tuyen Son bridge in Hoa Cuong Nam ward – Hai Chau ward - Danang city and currently exploited and managed by Trieu Dan Limited Liability company.

- Conditions of exploitation and delivery: favorable in the dry season and unfavorable in the rainy season.

- Supply capacity: about 500m^3/day.

- Quality: good, the sand is of coarse medium-grain that is good for concreting.

3) Stone materials

Stone supply sources for the project can be obtained from local mines as follows:

a) Dai La stone mine

Dai La stone mine located on the extended Hoang Van Thai road, average transport distance of 5.0Km; reserve of 1.30 million m^3/year, stones quality guaranteed for work construction.

In backup cases, the following mines can be used:

b) Phuoc Thuan stone mine

- Location: The stone mine is in Hoa Nhon commune - Hoa Vang district - Danang city

and currently exploited and managed by Asphalt and construction stone exploitation enterprise.

- Conditions of exploitation and delivery: exploited by machine, conditions of exploitation and delivery are favorable. The stone mine is about 5.10km far from the project site (of which 2.0km of 5.0m wide asphalt road, 1.0km of 10.5m wide of asphalt road and 2.1m of asphalt road 14B).

- Reserve: about 2,000,000m^3. (evaluated as Grade C reserves, not affecting the environment).

- Quality: According to the test results, the stone in the mine is gray green granite that is good for concrete and asphalt concrete. Some average physical and mechanical features of the mine are as follows:

+ Compressive strength when dry= 1026,5 kG/cm^2.

+ Saturation compressive strength= 1000,5 kG/cm^2.

c) Hoc Khe 2 stone mine:

- Location: Hoc Khe 2 stone mine is in Hoa Nhon commune - Hoa Vang district - Danang exploited and managed by Chu Lai JSC.

- Conditions of exploitation and delivery: The mine is exploited by machine, conditions of exploitation and delivery are favorable. The stone mine is about 5.90km far from the project site (of which 2.8km of 4.5m wide asphalt road; 1.0km of 10.5 wide asphalt road; 2.1km of asphalt Road 14B).

- Reserve: about 1,400,000m^3. (evaluated as Grade C reserves, not affecting the environment).

- Quality: According to the test results, the stone in the mine is gray green granite that is good for concrete and asphalt concrete. Some average physical and mechanical features of the mine are as follows:

+ Compressive strength when dry= 935,50 kG/cm^2.

+ Saturation compressive strength= 838,10 kG/cm^2.

d) Truong Ban stone mine

- Location: The stone mine is in Hoa Son commune – Hoa Vang district – Danang city currently exploited and managed by Truong Ban Construction Limited Liability company.

- Conditions of exploitation and delivery: The mine is conveniently exploited by machine.

- Reserve: about 3,000,000m^3

- Quality: stone at the mine is of gray green sericite schist that is good for concreting.

e) Phuoc Tuong stone mine

- Location: Phuoc Tuong stone mine is in Hoa Phat ward - Cam Le district - Danang, exploited and managed by Danang transport construction company.

- Conditions of exploitation and delivery: The mine is conveniently exploited by machine.

- Reserve: about 5,000,000m^3.

- Quality: stone in the mine is of gray green, gray black granite that is good for

concreting and asphalt concreting.

4) Concrete mixing plant:

- Location: the asphalt concrete mixing plant is in Hoa Nhon commune - Hoa Vang district - Danang city and currently managed by Asphalt and construction stone exploitation enterprise.

- Conditions of exploitation and delivery: are favorable and being used for various construction in the area. The plant is 3.10km from the project site (of which 1.0km of 10.5 wide road; 2.1km of asphalt Road 14B).

- The asphalt mixing plant meets the requirement on quality and environment and has been licensed to operate (photo attached).

- Capacity: 60-80T/h.

5) Other materials

- Cement, iron, steel... are obtained in Danang city, 15Km far from the construction site.

6) Disposal landfills

According to the plan, categories of land and construction waste raised from the project will be gathered to dispose at Khanh Son disposal landfill, 6km far from the works.

- Acreage of Khanh Son: 48 ha

- Location : Hòa Khánh Nam ward , Liên Chiểu district, Da Nang city

- Operating capacity: 700 tons of trash/ day

In case volume of waste generated is large, waste can be disposed to some following disposal landfills:

a) Disposal landfills no. 1 (BT1)

- Location: The disposal landfill is in Hoa Phu commune - Hoa Vang district - Danang city.

- Transport distance: about 12.0 km (of which 10.5 km of asphalt Road 604 and 1.50km of asphalt Road 14B).

- Conditions of transportation: are favorable in the dry season and unfavorable in the rainy season.

- Capacity: about 130,000m^3.

- Management unit: The People's Committee of Hoa Phu commune - Hoa Vang district - Danang city.

b) Disposal landfill no. 2 (BT2)

- Location: The disposal landfill is in Hoa Nhon commune – Hoa Vang district – Danang city

- Conditions of transportation: are favorable in the dry season and unfavorable in the rainy season.

- Capacity: about 150,000 m^3.

- Management unit: The People's Committee of Hoa Lien commune - Hoa Vang district - Tp. Danang.

c) Disposal landfill no. 3 (BT3)

- Location:: Km7+250, Road 605 in Dien Hoa commune - Dien Ban district - Quang Nam province.

- Transport distance: about 5 km to the project area.

- Conditions of transportation: favorable.

- Capacity: about 25,000m^3.

- Management unit: The landfill is under the ownership of Mr. Ho Ninh

d) Disposal landfill no. 4 (BT4)

- Location: Km7+340, Road 605 in Dien Hoa commune – Dien Ban district – Quang Nam province.

- Transport distance: about 5.1km to the project area.

- Conditions of transportation: favorable.

- Capacity: about 16.000m^3.

- Management unit: The landfill is under the ownership of Mr. Tran Van Loc (Mobile: 0905430727)

e) Disposal landfill no. 5 (BT5)

- Location: Km11+180, National road 14G in Hoa Phu commune - Hoa Vang district - Danang city

- Transport distance: about 12 km to the project area.

- Conditions of transportation: favorable.

- Capacity: about 10,000m^3.

- Management unit: The landfill is under the ownership of Ms. Nguyen Thi Loan (Mobile: 01644078819)

f) *Disposal landfill no. 6 (BT6)*

- Location: Km11+500, National road 14G in Hoa Phu commune - Hoa Vang district - Danang city

- Transport distance: about 12.4 km to the project area.

- Conditions of transportation: favorable.

- Capacity: about 60.000m^3.

- Management unit: The landfill is under the ownership of Mr. Pham Thanh Minh (Mobile: 0905274253).

1.4.4.3. Electricity and water for construction

- According to the project's basic design, the water supply source for road construction is taken from water wells. Drill wells to a depth of about 12m and use pumps to supply water for the construction.

- The power supply source is expected to be connected to the local power grid at the construction implementation area.

1.4.4.4. Construction method

Because the project construction volume is relatively large and requires prompt

completion progress, the construction unit should study and organize construction coordination between the work items for maximizing construction capacity by chain method using appropriate arrangement of equipment, machine and personnel.

Before the construction, the contractor shall notify the relevant units to coordinate closely during the construction process. This is an important and complex stage, which requires the coordination of the Employer and the construction unit with the local authorities to ensure the time schedule, timely dealing with the arising problems (if any).

Carry out the tasks to accurately redefine the boundaries of the project, prepare the service road, specify the supply of materials, and prepare the storing yard for materials, vehicles and construction manpower.

1.4.4.5. Traffic guarantee during construction

The DH2 is the main road facilitating the travel of the people in the area from the commune to the surrounding areas; therefore, in the course of construction, measures to ensure safe and smooth traffic flow are required.

Particularly for intersections (intersection with Road 14B, Road 18, Hoang Van Thai road, Road 602, Road 604...), the traffic flow should be ensured as follows:

- Establishing the construction sequentially for the extension part and the existing road surface;
- Arranging pile barrier in the construction area - reflective band, night signaling lights and traffic instructor... as prescribed.

1.4.4.6. Access road and material transport road

The construction location of the road DH2 can be accessed directly via the existing crossroads with the road DH2. However, the Client and construction contractor should pay attention to the reinforcement work on these local residential local roads and restoration to the original condition upon completed construction.

1.4.4.7. Main construction method

The construction methods depend heavily on the capacity of the constructor. Depending on the capacity of the contractor, plans and methods of construction may vary but the main construction method basically sticks with the following construction procedures:

- Preparation work.
- Site cleaning, construction scope identification.
- Excavation of road base, destruction and removal of masonry blocks, old floor...at sections where the road goes on the old land base, housing structures.
- Construction of drainage system from the downstream up.
- Construction of bridge.
- Road base filling with soil.
- Excavation of road form, compaction K95.
- Filling with hill soil, compaction K98.
- Curb concrete pouring.
- Pavement filling with soil, compaction K95.

- Crushed subgrade course construction.
- Completion of soil filling and construction of pavement.
- Establishment of asphalt concrete road surface layers.
- Other completion works: installation of signs, line marking....
- Maintenance work...
- Before the construction of the drainage system, it is needed to identify the water flow direction of the drainage system, select the order for ditch construction so that the construction process meets the requirements set out as well as make it easy to handle problems (if any).

** For sections that soft ground treatment is not required:*

- Ground cleaning, organic excavation, relocation of electricity lines and pipelines within the construction range;
- Construction of underground works (sewers, engineering culverts);
- Construction of the main road base, local residential area roads, restoration of irrigation ditches;
- Construction of curb, horizontal drainage trenches, installation of lighting system;
- Construction of road surface foundation structures, road base completion;
- Implementation of other completion works: installation of signs, line marking, other traffic safety works...

** For sections that soft ground treatment is required:*

- Ground cleaning, organic excavation, relocation of electricity lines and pipelines within the construction range;
- Soft soil treatment, road base filling with soil, soil filling and incremental loading;
- Unloading, construction of underground works (sewers, engineering culverts);
- Completion of road base at drains location;
- Construction of curb, horizontal drainage trenches, installation of lighting system;
- Construction of road surface foundation structures, road base completion.
- Implementation of other completion works: installation of signs, line marking, other traffic safety works...

1.4.5. Cost estimate of investment funding

- Total investment funding (including costs of construction, compensation, management and others) is **VND 524,718,145,000** (US$ 23,5 million) Of which, construction cost is VND 316,802,285,000 (US$ ~14,2 million) site clearance cost is VND 88,030,000,000 (US$ ~3,95 million) temporary cost for purchasing environmental protection tools/equipment is VND 75,500,000 (US$ ~3400) (including 15 garbage receptacles and 5 portable toilets), the rest funding is others.

1.4.6. Progress of the project

- The estimated progress of the road DH2 is: 24 months.
- The general schedule of the road DH2 project is shown in the table below:

Activities	Start	End	Status
Identification		May 2015	Done
Preparation	May 2015	July 2015	Done
Appraisal and approval	Quarter 4/2015	Quarter 2/2016	In the process of implementation
Implementation and Monitoring	quarter 4/2016	quarter 4/2018	To be done
Evaluation			To be done

CHAPTER 2: NATURAL ENVIRONMENTAL AND SOCIO-ECONOMIC CONDITIONS OF THE PROJECT AREA

2.1. Natural and Environmental Conditions

2.1.1. Topographical and geographical characteristics

2.1.1.1. Geographical characteristics of the project area

* ***Geographical structure***: The geographical structure of the surface cover at the project area is mainly young formations with origin from the quaternary sediment ($amQ_{IV}3$ và $bmQ_{IV}3$) with large varied thickness, include soil layers such as silt loam, loam, sand, clay sand and residual soil of bed-rock.

* ***Strata***: The results of strata survey and field survey as well as laboratory experiments of soil and rock samples showed that the strata from top to down include following layers:

The survey area is located in line with the Huong Hoa – Hue – Danang map (E- 48-XXXV & E-48-XXXVI & E-49-XXXI) at scale of 1:200.000 published by the Department of Geography of Vietnam in 1996.

According to the above map, monitoring and geographical exploration boring, the strata in the region are mainly:

+ Undivided quaternary: (ad, ed) pebbly, grit, sand and clay in thickness of 3-10m.

+ Upper Holocen (amQ_{IV}^3) – Sand, powder, clay in thickness of 2-25m.

+ Middle Holocen (mQ_{IV}^2) - lower: Sand, gravel, grit. Upper: clay, powder in thickness of 10-20m.

+ A Vuong formation: - Lower subformation ($\in_1$-O1-av1). sericite clorit schist, Biotite schist.

* ***Physical properties of the soil and rock layers in the project area***:

The geological survey field drilling work, the laboratory results of physical and mechanical rock and soil samples and the results obtained from the geological survey of neighboring structures show that the stratum structures in the construction area are described from top to bottom as follows:

*** *Strata 1*:** Coarse sand and gray yellow clay slurry, only existed at Voi bridge with strata thickness of 1.20m (LK-VOI)

*** *Strata 2*:** Yellow gray, reddish brown silty clay in quasi-plastic state, the strata has been detected by LK-DG and LK-TAY drills with thickness changed from 3.0m (at LK-TAY) to 5.60m (at LK-DG). The field standard penetration test shows the value of N30 ranging 9-10.

*** *Strata 3*:** Yellow gray clay loam in semi-hard state. The strata is evenly distributed, laid directly under strata 2 and existed in all drill holes with thickness changed from 2.50m (at LK-TAY) to 11.60m (at LK-VOI). The standard penetration test (SPT) result shows the value of N30 ranging 12-28.

*** *Strata 4*:** Perse clay loam in soft-plastic state. The strata is directly laid under strata 3 and detected by 04 drill holes with thickness changed from 2.70m (LK-TRANG) to 4.90m (LK-KM0-171). The SPT result shows the value of N30 ranging 4-8.

*** *Strata 5*:** Small grained sand mixed with white gray, perse clay slurry in saturation state and medium dense. The strata is detected by the drilling hole at Tay bridge with thickness of 3.0m (LK-TAY). The SPT result shows the value of N30 ranging 18 - 21.

*** *Strata 6*:** Brown gray clay slurry in hard state. The strata is detected at 04 drill holes with thickness changed from 2.80m (LK-KM0+171) to 4.90m (LK-VOI). The SPT result

shows the value of N30 ranging 21 - >30.

**** Strata 7*:** Strongly weathered, cracked, broken schist. The strata is detected at 05 drill holes with the maximum thickness of 9.70m. Physical and mechanical parameters as follows:

- Compressive strength when dry = 132,60 kg/cm2;
- Saturated compressive strength = 79,60 kg/cm2;

* ***Hydrogeology***:

The area expected to improve and upgrade the DH2 (Hoa Nhon - Hoa Son) has a maximum depth of 23.0m as surveyed. Based on the documents collected, no typical aquifers have been shown. The aquifer relates directly with the surface water, the main water supply sources for this layer are river water and stormwater through geological windows. The hydrological report result of some neighboring structures shows that groundwater quality is poor and cannot be used for living, mainly used for construction or watering crops

2.1.1.2. Topographical Features of the Project area

- The section from road beginning to Voi bridge (Km4+869.50) is under Hoa Nhon commune, Hoa Vang district. The terrains along this route are mostly rice fields, and some low hills. The elevation changes from 2.5m to 30.0m, the cross slope is not big.

- The section from Voi bridge (Km4+869.50) to the road ending is in Hoa Son commune. The route terrains are mostly low hills with elevation changing from7.0m to 22.0m and not big cross slope.

2.1.2. Climate, Hydrographic and Oceanographic Conditions

2.1.2.1. Climate conditions

According to statistics of the Central region meteorological station, Danang has a typically tropical monsoon climate with high temperatures and slight volatile. Danang's climate is interlaced between climate of the Northern and Southern regions with the typical tropical features. Danang has two separate seasons with rainy season lasting from August to December and dry season between January and July. Cold winter occasionally occurs but does not last long.

**** Temperature:***

Table 2-1: Monthly average air temperature in Danang from 2000-2013

Month / Year	1	2	3	4	5	6	7	8	9	10	11	12	Year
2000	22.0	21.7	24.1	26.7	27.8	28.7	29.1	29.0	27.4	26.1	23.7	22.6	25.7
2001	22.7	22.3	24.4	27.4	28.4	28.7	29.9	27.9	27.8	26.4	23.4	22.0	25.9
2002	21.7	22.4	24.4	26.7	28.8	29.5	30.5	28.2	27.0	26.0	24.7	23.5	26.1
2003	20.8	23.6	24.5	27.0	28.5	29.6	28.8	29.0	27.1	25.9	24.5	21.5	25.9
2004	21.9	21.2	24.1	26.5	28.4	29.2	28.3	28.9	27.3	25.0	24.3	21.8	25.6
2005	21.4	23.9	22.8	25.8	29.0	30.5	28.4	28.7	27.9	26.3	25.2	21.2	25.9
2006	21.6	23.3	24.0	26.9	27.6	30.2	30.1	28.3	27.3	26.7	26.2	23.4	26.3
2007	21.3	23.7	25.4	26.4	28.1	29.8	29.4	28.8	27.8	26.0	23.2	23.9	26.2
2008	21.6	19.4	23.3	27.0	27.7	29.4	29.5	28.6	27.8	26.3	24.4	21.5	25.5
2009	20.6	23.7	25.5	26.9	27.6	30.6	29.3	29.2	27.5	26.7	24.4	23.2	26.3
2010	23.1	24.4	24.6	26.9	29.4	29.7	29.1	28.1	27.7	25.9	23.7	22.5	26.3
2011	20.0	21.5	21.5	24.9	28.1	29.3	29.8	29.2	26.9	25.7	24.6	20.8	25.5
2012	21.4	22.2	24.3	27.0	29.3	30.6	29.6	29.7	27.5	26.3	26.0	24.5	26.5
2013	21.9	24.4	25.3	27.1	29.2	29.6	28.6	29.3	27.1	26.0	25.2	20.8	26.2

Source: The Mid-Central Regional Hydro-Meteorological Center

Average yearly temperature is about 25.9°C, highest in June, July and August and varies from 28 to 30^0C, lowest in December, January and February, varies from 18 to 23^0C. In particular in Ba Na mountainous area, at the elevation of approximate 1,500m, average temperature is about 20^0C. However, due to effects of climate change, in the recent years, temperature and other meteorological elements (rain, humidity, etc.) no longer follow the rules of previous years.

**** Rainfall:***

Table 2-2: Average monthly/yearly rainfall in Danang from 2000 to 2013

Month / Year	1	2	3	4	5	6	7	8	9	10	11	12	Year
2000	205.7	9.9	1.8	155.3	122.7	118.4	43.0	329.9	126.6	857.2	395.3	462.5	2828.3
2001	44.5	40.7	92.5	0.0	272.8	208.1	36.1	512.1	107.9	728.4	307.3	400.4	2750.8
2002	32.7	30.6	3.7	13.3	38.5	104.3	30.2	375.8	526.9	527.4	470.2	212.2	2365.8
2003	22.0	20.2	37.6	17.8	110.3	95.7	12.7	85.7	478.0	412.6	295.2	159.7	1747.5
2004	87.9	6.9	9.5	12.8	43.7	154.3	244.1	69.1	128.6	266.1	258.1	94.0	1375.1
2005	36.0	5.8	36.7	12.0	20.2	22.0	129.7	209.8	236.0	500.8	429.2	214.1	1852.3
2006	97.9	33.8	2.2	9.2	68.7	2.3	127.3	346.2	394.4	618.8	278.6	254.4	2233.8
2007	153.3	0.4	58.0	55.3	156.4	7.1	24.1	152.2	252.8	1147.4	893.6	163.8	3064.4
2008	82.8	33.6	53.7	67.0	157.7	35.5	47.9	56.6	230.3	1006.5	568.6	185.3	2525.5
2009	159.5	23.3	23.0	179.9	65.3	36.2	186.5	152.8	1375.7	455.8	194.4	165.4	3017.8
2010	87.9	0.0	10.3	4.7	62.1	76.1	245.2	326.3	166.1	656.3	549.2	52.6	2236.8
2011	160.8	0.0	31.2	8.2	35.0	100.5	12.8	139.1	812.1	791.3	1218.0	339.2	3647.8
2012	56.8	37.4	0.0	21.3	10.9	46.1	32.0	180.5	581.7	367.5	302.4	59.5	1696.1
2013	17.5	44.5	44.8	14.2	43.3	25.2	131.5	79.7	750.9	369.0	1151.0	34.4	2706.0

Source: The Mid-Central Regional Hydro-Meteorological Center

The annual average rainfall is 2,504.57 mm/year; the highest rainfall from 550-1,000 mm/month appears in October and November; lowest rainfall from 23-40 mm/month in January, February, March and April.

**** Air humidity:***

Table 2-3: Average monthly/yearly humidity in Danang from 2000 to 2013

Month / Year	1	2	3	4	5	6	7	8	9	10	11	12	Year
2000	88	84	84	85	82	80	77	79	81	86	84	89	83
2001	87	84	86	83	81	81	76	84	82	86	83	87	83
2002	84	84	85	84	78	78	73	82	86	86	85	87	83
2003	84	88	84	84	81	77	79	79	87	85	85	87	83
2004	86	84	85	84	80	76	81	78	84	83	86	85	83
2005	84	85	84	83	77	71	80	78	83	86	86	89	82
2006	86	85	84	81	77	73	71	82	82	85	82	82	81
2007	87	83	85	81	80	74	76	78	81	87	85	85	82
2008	85	80	85	82	81	77	75	78	82	88	85	87	82
2009	82	86	83	81	82	72	76	77	84	82	83	84	81
2010	84	85	83	83	78	77	77	82	83	85	88	84	82
2011	83	83	82	84	77	75	70	77	88	87	86	89	82
2012	88	87	82	81	77	70	73	74	85	84	88	85	81
2013	84	84	86	83	77	72	79	77	85	83	86	80	81

Source: The Mid-Central Regional Hydro-Meteorological Center

The average air humidity is 83.4%; the highest humidity is in September, October and November ranging from 85.67% to 87.67%; lowest in June, July ranging from 76.67% to 77.33%.

**** Sunshine hours:***

The average number of sunshine hours per year is 2,156.2; highest in May, June ranging from 234 to 277 hours/month; lowest in November, December ranging from 69 to 165 hours/month.

Table 2-4: Average monthly and yearly sunshine hours in Danang from 2000-2013

Month / Year	1	2	3	4	5	6	7	8	9	10	11	12	Year
2000	121.1	144.1	177.8	208.9	219.4	237.3	216.5	253.0	146.6	113.5	101.9	34.4	1974.5
2001	127.8	137.3	152.8	223.0	201.5	224.6	242.5	191.9	224.7	164.1	118.9	85.0	2094.1
2002	161.2	175.7	176.3	232.7	237.2	267.0	191.3	174.7	120.8	174.7	101.6	101.7	2114.9
2003	115.6	162.2	173.6	229.9	256.6	239.0	272.7	205.6	163.4	150.3	133.5	37.7	2140.1
2004	94.9	153.0	133.9	215.0	283.2	238.9	218.0	242.0	162.3	146.8	111.5	125.3	2124.8
2005	157.1	171.6	150.7	193.4	245.7	220.2	216.6	170.3	181.1	109.2	138.0	11.7	1965.6
2006	94.2	115.0	163.5	240.4	260.8	289.8	199.4	177.8	172.4	193.3	209.4	77.3	2193.3
2007	45.8	181.8	173.5	180.5	231.0	277.2	290.1	170.4	199.8	75.6	48.8	125.7	2000.2
2008	110.4	24.0	157.9	241.4	227.2	226.6	277.2	201.7	165.2	112.2	68.0	49.2	1861.0
2009	116.8	178.0	187.4	163.2	226.1	256.4	211.9	235.1	135.4	136.2	116.0	150.3	2112.8
2010	149.2	200.7	196.7	210.1	268.1	283.9	276.9	209.8	202.2	102.9	49.9	110.4	2260.8
2011	40.0	162.0	113.0	175.0	259.0	222.0	233.0	231.0	105.0	107.0	115.0	18.0	1780.0
2012	63.0	126.0	178.0	209.0	257.0	185.0	242.0	219.0	167.0	164.0	155.0	132.0	2097.0
2013	126.0	154.0	172.0	172.0	284.0	237.0	216.0	166.0	146.0	135.0	110.0	51.0	1969.0

Source: The Mid-Central Regional Hydro-Meteorological Center

**** Wind and storms:***

The prevailing wind direction in Danang is the north, east and northeast (from October to April of the following year) and the west and southwest (from May to September). In the city center, the frequency of calm wind is quite high (30-50%).

The average wind speed in 2009 was slightly low (1.4 m/s) and not too different with the previous years. The average wind speed varies from 2.3 to 2.7m/s. The annual average number of hurricanes is 0.84. Nevertheless, no storm has been recorded in some years while in other years there are from 3 to 4 hurricanes. Storms frequently occur from May to August. The highest average wind speed of storms and tropical depression ranges from 15 to 20 m/s (level 7-8).

2.1.2.2. Hydrological characteristics

1) Flooding situation in the project area:

Hoa Vang district has the biggest number and length of passing rivers in Danang city. In the rainy season, most of the areas in the district are flooded.

Overall, the flood season in this area starts from October and ends in December. The characteristics of floods is that they pour downstream quite suddenly; flood magnitude and intensity and flood water level are high, often causing serious flooding in the downstream.

The road section from Km0+0.00 (Giang bridge end) to Km2+0.00 goes almost parallel to Tuy Loan river, 50-500m from the river bank. Some sections of the road go through low-lying rice fields and are often flooded in the rainy season.

According to survey data on the annual flood levels, submerged depth is from 0.5 - 1.5m, particularly in 1999, the submerged depth is from 2 - 3.5 m. The flooding is mainly due to the rising Tuy Loan river water, impeding the drainage from the road upstream.

The road section from Km4+0.00 to the road ending is in Hoa Son commune, having steep hilly terrain, elevation h> 8m, hardly flooded or flooded locally occurs for a short time at bridge and culvert locations.

2) Hydrological characteristics in the project area

** Hydrological characteristics of Tuy Loan river:*

Tuy Loan river (or Thuy Loan river), a tributary of Cau Do river (or Cam Le river, Han river, depending on the segment), runs entirely in the territory of Hoa Vang district, Danang city. The river is about 30 km long, originating from Ba Na mountain in the west of Hoa Vang district. The river runs along west-east direction until reaching Hoa Tien commune, Hoa Vang district, it merges with Yen river forming Cau Do river.

Tuy Loan river has two major tributaries – Lo Dong river on the right bank running from the southwest of Hoa Vang district and a small river on the left bank. Both tributaries enter Tuy Loan river in Hoa Phong commune. Lu Dong river has a small branch called Dong Nghe river.

The catchment area of Tuy Loan river is 160 km^2 and the flow rate is 6.47 m^3/s.

2.1.2.3. Climate change and sea level rise

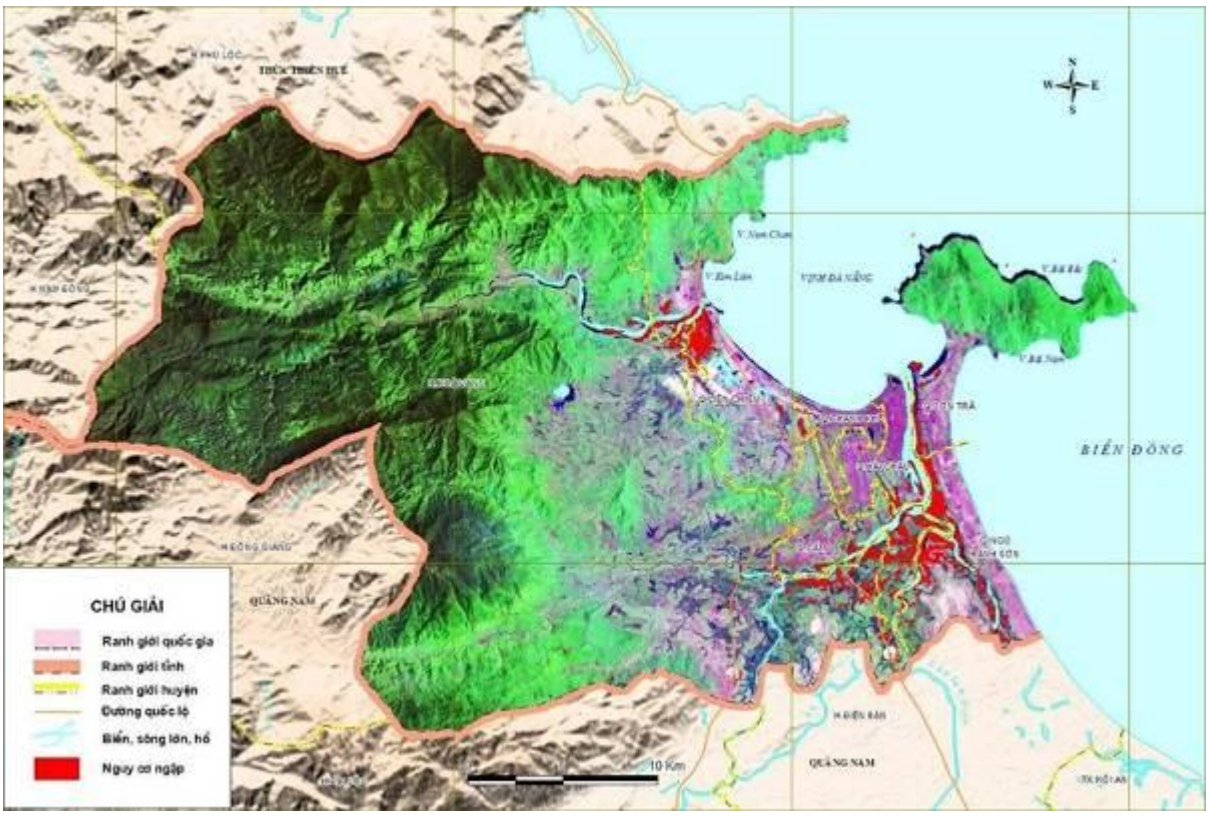


Figure 2-1: Flooding map of Danang city corresponding to sea level rise of 1m

(Source: Climate change and sea level rise scenarios, Ministry of Natural Resources and Environment, 2012)

In 2011, the Ministry of Natural Resources and Environment has released the report on "Scenarios of Climate Change and Sea Level Rise for Vietnam" which represents maps of rising levels of temperature, rainfall and flooding risks for some areas in Vietnam.

Danang is one of the coastal cities that is likely to be severely affected by sea level rise. Therefore, the planning of areas at risk of inundation can also be considered as an important direction for the development track of the City.

The map above shows that when the sea level rises by 1m, the areas along Tuy Loan river and the east bank of Han River where Cam Le river and Vinh Dien river join (mainly under Cam Le, Ngu Hanh Son districts) are the most vulnerable areas to floods.

The study result of climate change and sea level rise scenario for Danang city is as follows:

+ Air temperature of Danang city by the end of the 21st century increases by 2.5^{0}C on the average.

+ Rainfall of Danang city by the end of the 21st century appears opposite in terms of annual rainfall, rain seasons and the biggest rain amount on one day. The average annual rainfall would increase by 5.0%. By the end of the 21st century, the rainfall in winter and spring would decrease over 14%; in summer and autumn, increase over 18%. The biggest rainfall on one day would decline sharply at 35% - 40%.

+ The sea level would rise to a height of 1.0 m by the end of the 21st century under the high emission scenario, the road DH2 would not likely to be flooded.

Thus, the flood flow generated from the biggest one-day rainfall tends to decrease and fall sharply by the end of the 21st century. This may confirm the reduction in the biggest flow into the rivers in Danang city. The combined impacts of climate change and sea level rise will follow the trend of reducing floods in the DH2

2.1.3. Quality of air, water, soil and sediment

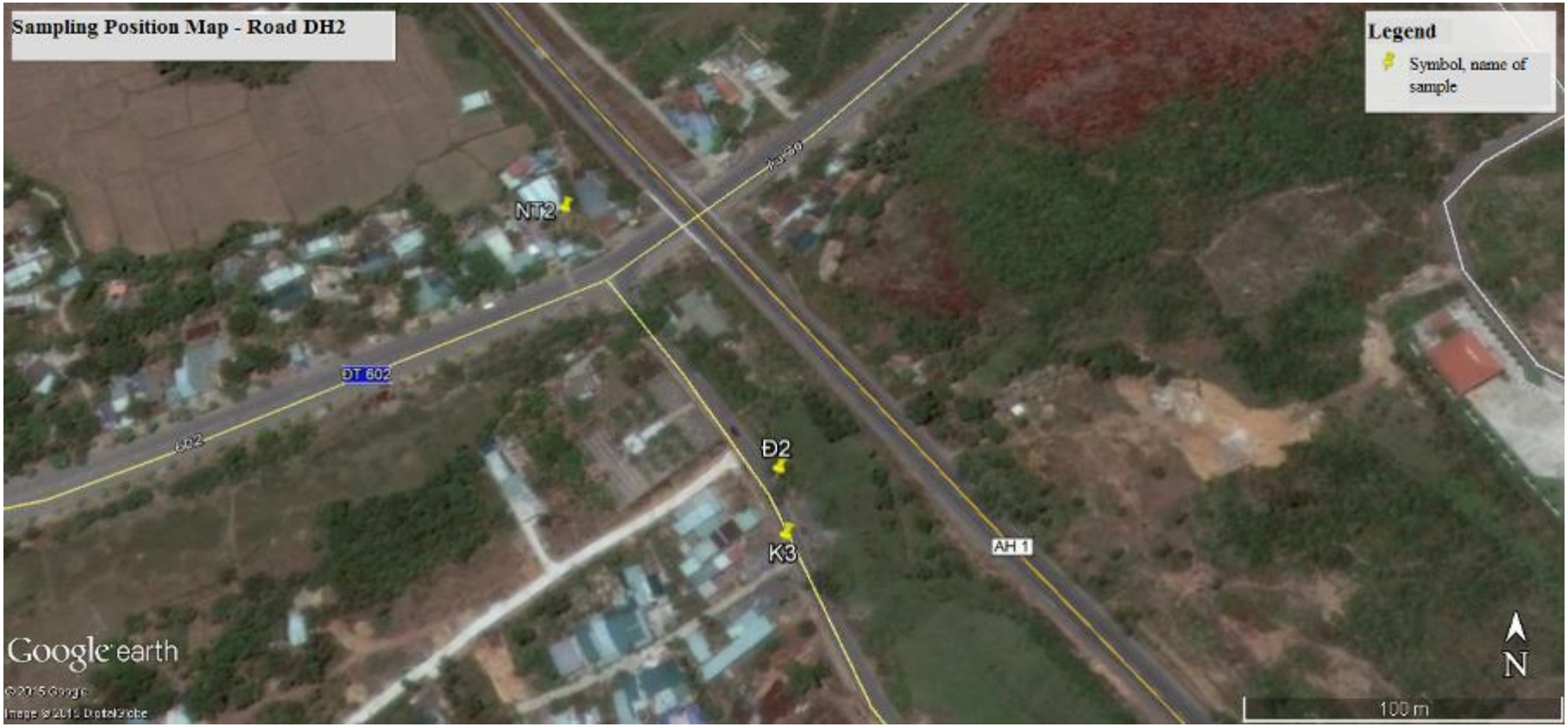
To assess the quality status of the environmental components in the project area, on 14 June 2015, the Client and Consultancy firm in collaboration with the Meteorological Observatory Central implemented the survey, monitoring, measuring and sampling the environment under the Vietnamese standards and the analysis in laboratory. Simultaneously they collected information and relevant data. The detailed results of each sample analysis are in the Annexes.

The methods of measurement and sampling at site, maintenance, transportation, treatment and analysis of samples in laboratory are implemented in accordance with current Vietnam's standards.

Figure 2-2: Position map of sampling air, water, soil, sediment and aquatic species at the project area

Notes: NN1: Sampling underground water
D1: Sampling soil;
TS1-TS2: Sampling aquatic samples.
TT1: Sampling sediment.
K1: Sampling air.
NM1: Sampling surface water.

Notes : NN2: Sampling underground water
TT2: Sampling sediment
K2: Sampling air
NM2: Sampling surface water



Note: D2: Sampling soil;
K3: Sampling air;
NT2: Sampling domestic wastewater;

2.1.3.1. Status of air environment quality

Table 2-5: Ambient air sampling positions

No.	Symbol	Sampling location	Coordinates	
			Longitude	Latitude
1	K1	DH2 section in the residential area in Thach Nham Tay village, Hoa Nhon commune near Giang bridge (Road 14B)	108° 8'29.67"	16° 0'1.49"
2	K2	DH2 section crossing Hoang Van Thai, Ba Na-Suoi Mo	108° 6'43.21"	16° 1'36.17"
3	K3	DH2 section in the residential area at Tung Son crossroad, Hoa Son commune, intersecting with Au Co road	108° 5'52.33"	16° 3'31.28"

* *Result of analysis and evaluation:*

The parameters for monitoring and analyzing air samples include: Noise, CO, NO_2, SO_2 and suspended dust. The analytical results are shown in the table below:

Table 2-6: Measurement and analysis results of ambient air quality

No.	Parameter	Unit	Result			Standard for comparison
			K1	K2	K3	
1	Noise	dBA	65.8	55.7	62.3	70(1)
2	Suspended dust	mg/m3	0.46	0.20	0.29	0.30(2)
3	NO2	mg/m3	0.084	0.046	0.052	0.20(2)
4	SO2	mg/m3	0.073	0.038	0.046	0.35(2)
5	CO	mg/m3	5.426	3.742	5.427	30(2)

Source: Results of environmental monitoring implemented by the Mid-central regional Hydrometerlogical Center on 14 June 2015

Notes: - (-): Not defined by standard..

- (1): QCVN 26:2010/BTNMT: National technical regulations on noise

- (2): QCVN 05:2013/BTNMT: National technical regulations on ambient air quality.

- (3): QCVN 06:2009/BTNMT: National technical regulations on some hazardous substances in ambient air.

* *Comments:*

- Noise level measured at the locations ranges from 55.7-65.8 dBA, mostly remains within the permitted standard limit (QCVN 26:2010/BTNMT).

- Dust content at K1 point (on Road DH2) near Giang bridge area is 0.46 mg/m3 exceeding QCVN 05:2013/BTNMT about 1.53 times; other areas including K2, K3, the dust levels stay within the permissible limit. Dust content at K1 point exceeds permitted standards

due to the region with high density, located near the intersection with old National QL14B road with more vehicles on the roads. K2, K3 points are located in the area of agricultural land, few households and motor vehicles, dust content remains low.

- Content of toxic gases (NO2, SO2, CO) in the ambient air environment at 7 monitoring locations mostly remain within the permitted standard limit (QCVN 05:2013/BTNMT).

2.1.3.2. Surface water quality

1) Quality of surface water:

Sampling locations are shown in the table below:

Table 2-7: Surface water sampling location

No.	Symbol	Sampling location	Coordinates	
			Longitude	Latitude
1	NM1	Tuy Loan river surface water at Giang bridge	108° 8'28.61"	15°59'57.04"
2	NM2	Surface water of the stream running by Road DH2 near the crossroad with Ba Na-Suoi Mo road	108° 6'43.14"	16° 1'35.25"

* *Results of measurement and analysis:*

Table 2-8: Analytical result of surface water quality

No.	Parameter	Unit	Result		QCVN 08:2008/BTNMT			
			NM1	NM2	A1	A2	B1	B2
1	pH	-	6.94	6.84	6-8.5	6-8.5	5.5-9	5.5-9
2	DO	mg/L	5.68	6.78	6	5	4	2
3	TSS	mg/L	30.2	20.7	20	30	50	100
5	BOD_5	mg/L	6.7	4.9	4	6	15	25
4	COD	mg/L	15	11	10	15	30	50
6	NH_4^+-N	mg/L	0.527	0.297	0.1	0.2	0.5	1
7	NO_3^--N	mg/L	0.621	0.276	2	5	10	15
8	NO_2^--N	mg/L	0.004	0.003	0.01	0.02	0.04	0.05
9	PO_4^{3-}-P	mg/L	0.057	0.058	0.1	0.2	0.3	0.5
10	Total grease oil	mg/L	0.15	0.10	0.01	0.02	0.1	0.3
11	Coliform	MPN/100mL	7,500	3,400	2,500	5,000	7,500	10,000

Source: Results of environmental monitoring implemented by the Mid-Central Hydrometerological Center on 14 June 2015

Note :

A1 – Reasonable use for water supply purposes and for other purposes such as type A2, B1 and B2.

A2 - For the purpose of water supply, however applying appropriate processing technology; conservation of aquatic flora and fauna, or the use purposes as B1 and B2.
B1 -Irrigation purposes or other purposes may require the same water quality or the use purpose as type B2.
B2 - Hydro traffic and other purposes with low water quality requirements

Comments:

a) Values of pH, DO content, TSS, salinity:

The pH value of the surface water samples in the project area is 6.84 and 6.94 meeting A1-A2 standards. The content of total suspended solids in surface water is 20.7 and 30.2 mg/L satisfying A1-B1 standards. DO content level in surface water are 5.68 and 6.78 mg/L meeting A1-A2 standards.

b) Content of nutrients (NH_4^+-N, NO_3^-N, NO_3^-N, PO_4^{3-}-P):

Content levels of NH_4^+-N in the surface water samples are 0.297-0.527 mg/L satisfying standards under A2-B1 columns.

Content levels of NO_3^--N are 0.276-0.621 mg/L, satisfying standard under A1 column. Content levels of NO_2^--N are 0.003-0.004 mg/L within the permitted limit.

Content levels of PO_4^{3-}-P are 0.057-0.058 mg/L, mostly satisfying standard under A1 column.

c) Organic contents (COD, BOD_5):

Content levels of COD are 11-15 mg/L, mostly meeting QCVN in columns A1-A2.

Content levels of BOD_5 are 4.9-6.7 mg/L within A1-B1 columns

d) Content of grease, oil:

The content levels of grease, oil in the samples are 0.10-0.15 mg/L, mostly within the permitted range in B1-B2 columns.

e) Coliform content:

The Coliform content is 3,400-7,500 MPN/100mL, within standards under A1-B1 columns.

In conclusion, environmental monitoring result shows that water quality of Tuy Loan river (NM1) doesn't meet the B1 irrigation standard for NH_4^+-N and total grease.

Surface water quality on stream through DH2 road, near Ba Na- Suoi Mo road meet B1 standard for irrigation at all monitoring standards.

2) Underground water quality:

Table 2-9: Underground water sampling location

No.	Symbol	Sampling location	Coordinates	
			Longitude	Latitude
1	NN1	Underground water in Thach Nham Tay village, Hoa Nhon commune, near Giang bridge (Road	108° 8'30.18"	16° 0'1.11"

		14B)		
2	NN2	Underground water at the DH2 point near Ba Na - Suoi Mo road	108° 6'42.85"	16° 1'31.06"

* *Results of analysis and evaluation:*

Table 2-10: Analytical result of underground water quality

No.	Parameter	Unit	Result		QCVN 09:2008/BTNMT
			NN1	NN2	**Limit value**
1	pH	-	6.39	6.50	5.5-8.5
2	Hardness	mg/L	86.250	90.125	500
3	TS	mg/L	271.5	176.8	1500
5	COD	mg/L	1.40	0.68	4
4	NH_4^+-N	mg/L	0.512	0.059	0.1
6	NO_3^--N	mg/L	1.715	5.741	15
7	SO_4^{2-}	mg/L	98.75	79.54	400
8	As	mg/L	0.0012	0.0018	0.05
9	Fe	mg/L	0.165	0.228	5
10	Cl^-	mg/L	35.460	24.576	250
11	Coliform	MPN/100mL	16	KPH(<3)	3

Source: Results of environmental monitoring implemented by the Mid-Central Hydrometerological Center on 14 June 2015

Comments:

1) pH, TSS, hardness:

The pH values of the underground water samples at the project site are 6.39 - 6.50. Total solids content in the underground water is from 176.8 to 271.5 mg/L satisfying the standard. Hardness level ranges 86.250 to 90.125 mg/L satisfying the standard.

2) Content of nutrients (NH_4^+-N, NO_3^-N, SO_4^{2-}), chloride:

Content of NH_4^+-N permitted is 0.059-0.512 mg/L, the NN2 sample satisfies the permitted standard, the NN1 sample does not satisfy the standard

Content of NO_3^--N is 1.715-5.741 mg/L, meeting the standard.

Content of SO_4^{2-} is 79.54-98.75 mg/L, mostly satisfying the standard.

Content of chloride is from 24.576-35.400 mg/L, mostly meeting the standard.

3) Organic content (COD):

Content of COD is 0.68-1.40mg/L, mostly meeting the standard.

4) Content of heavy metal As, Fe:

Content of heavy metals in the underground samples: As is 0.0012-0.0018 mg/L, mostly remaining within the permitted limit; Fe is 0.165-0.228 mg/L remaining within the permitted limit.

5) Content of Coliform:

Content of Coliform permitted is 1-16 MPN/100mL, the NM1 sample does not satisfy the standard.

3) Domestic wastewater quality:

Table 2-11: Domestic wastewater sampling location

No.	Symbol	Sampling location	Coordinates	
			Longitude	Latitude
1	NT1	Wastewater at Thach Nham Tay village, Hoa Nhon commune near Dung carpentry base	108° 8'31.02"	16° 0'1.22"
2	NT2	Wastewater at crossroad DH2 and Au Co road, behind Dieu Linh grocery	108° 5'49.48"	16° 3'35.53"

* *Results of analysis and evaluation:*

Table 2-12: Analytical result of domestic wastewater quality

No.	Parameter	Unit	Result		QCVN 14:2008/BTNMT			
			NT1	NT2	**A1**	**A2**	**B1**	**B2**
1	pH	-	6.56	6.84	6-8.5	6-8.5	5.5-9	5.5-9
2	TSS	mg/L	40.6	38.1	20	30	50	100
3	COD	mg/L	26	35	10	15	30	50
5	NO_3^--N	mg/L	0.635	0.284	2	5	10	15
4	SO_4^{2+}	mg/L	0.075	0.068	-	-	-	-
6	Cu	mg/L	0.0070	0.0075	0.1	0.2	0.5	1
7	Pb	mg/L	KPH(<0.0055)	KPH(<0.0055)	0.02	0.02	0.05	0.05
8	Fe	mg/L	0.162	0.112	0.5	1	1.5	2
9	Cd	mg/L	KPH	KPH	0.005	0.005	0.01	0.01
10	Hg	mg/L	KPH	KPH	0.001	0.001	0.001	0.002
11	Cr VI	mg/L	KPH	KPH	0.01	0.02	0.04	0.05
12	Coliform	MPN/100mL	7500	12.10^3	2500	5000	7500	10000

Source: Results of environmental monitoring implemented by the Mid-Central Hydrometerological Center on 14 June 2015

KPH: Not detected.

Comments:

1) Values of pH, TSS:

The pH value of the wastewater samples is 6.56 - 6.84 meeting the standard. The content of total suspended solids is 38.1 - 40.6 mg/L satisfying the standard under A2-B1 columns.

2) Content of nutrients (NO_3^-N, SO_4^{2-}):

Content of NO_3^-N is 0.284-0.635 mg/L, satisfying the standard under A1 column.

Content of SO_4^{2-} is 0.068-0.075 mg/L, the standard does not define this parameter.

3) Content of heavy metal Cu, Pb, Fe, Cd, Hg, Cr VI:

Content of heavy metals in waste water samples: Cu is 0.001-0.002 mg/L; Fe 0.112-0.162 mg/L mostly remaining within the permitted limit underA1 column. Contents of Pb, Cd, Hg, Cr VI are not detected at the sampling locations.

4) Content of Coliform:

Coliform content for domestic wastewater is 7500-12x10^3 MPN/100mL, NT1 sample satisfies the standard under B1 column, NT2 sample exceeds B2 column limit by 270 times.

2.1.3.3. Status of soil quality

Soil sampling locations are shown in the table below:

Table 2-13: Soil sampling location

No.	Symbol	Sampling location	Coordinates	
			Longitude	Latitude
1	D1	Soil sampling at Thach Nham Tay village, Hoa Nhon commune	108° 8'28.09"	16° 0'1.54"
2	D2	Soil sampling at the crossroad of DH2 and Au Co road, parallel to National Highway 1A	108° 5'52.25"	16° 3'32.06"

* *Results of analysis and evaluation:*

Table 2-14: Soil quality analysis result

No.	Parameter	Unit	Result		QCVN 4:2008/BTNMT	
			D1	D2	Agricultural land	Residential land
1	Cd	mg/kg of dry soil	0.248	0.275	2	5
2	As	mg/kg of dry soil	0.184	0.167	12	12
3	Hg	mg/kg of dry soil	KPH(<0.1)	KPH(<0.1)	-	-
5	Fe	mg/kg of dry soil	0.347	0.572	-	-
4	Pb	mg/kg of dry soil	22.517	19.842	70	120
6	Cu	mg/kg of dry soil	21.248	16.853	50	70

Source: Results of environmental monitoring implemented by the Mid-Central Hydrometerological Center on 14 June 2015

Notes: (-): not defined by the standard; KPH: Not detected

Comments:

Contents of heavy metals Cd, As, Zn, Hg, Vr2, Fe, Pb, Cu in soil samples are detected with low levels, within the permitted limit of standard QCVN 43:2012/BTNMT for agricultural land and residential land.

2.1.3.4. Status of sediment quality

Table 2-15: Sediment sampling location

No.	Symbol	Sampling location	Coordinates	
			Longitude	Latitude
1	TT1	Sediment sampling at Tuy Loan river area in Thach Nham Tay village, Hoa Nhon commune	108° 8'27.91"	16° 0'0.59"
2	TT2	Sediment at the stream running by DH2, near the intersection with Ba Na-Suoi Mo road (Tuy Loan river tributary)	108° 6'42.86"	16° 1'34.44"

* *Results of analysis and evaluation:*

Table 2-16: Analytical result of sediment quality

No.	Parameter	Unit	Result		QCVN 43:2008/BTNMT	
			TT1	TT2	Fresh water	Salty water, brackish water
1	Cd	mg/kg of dry soil	KPH(<0.2)	KPH(<0.2)	3.5	4.2
2	As	mg/kg of dry soil	1.375	1.812	17.0	41.6
3	Hg	mg/kg of dry soil	KPH(<0.1)	KPH(<0.1)	0.5	0.7
5	Fe	mg/kg of dry soil	0.276	0.384	-	-
4	Pb	mg/kg of dry soil	22.384	19.752	91.3	112
6	Cu	mg/kg of dry soil	21.942	15.792	197	108

Source: Results of environmental monitoring implemented by the Mid-Central Hydrometerological Center on 14 June 2015

Notes: (-): not defined by the standard; KPH: Not detected

Comments:

The contents of heavy metals Cd, As, Hg, Fe, Pb, Cu are detected in the sediment samples with low levels, within the permitted limit of standard QCVN 43:2008/BTNMT for sediment in areas of freshwater, salty water and brackish water.

2.1.4. Biological resources

Hoa Vang district has abundant forest resources with the existing forest area of 51,297.6 ha.

The field surveys implemented by the consulting firm showed that at the project site there is no rare/native species in need of protection. The project location also does not affect the National Park and any nature reserve. The vegetation here is mainly artificial, including 2-crop rice and some fruit trees, ornamental trees which are intercropped and scattered in the residential areas. Also, there are many scrubs, grass scattered in the area. Animals are mostly livestock raised in households. Some wild animals common in this region are the rodents and birds.

The road DH2 is about 12.5km away from Ba Na – Nui Chua Nature Reserve as the crow flies to the East and about 19km away from Son Tra Nature Reserve to the Southwest. Ba Na - Nui Chua Nature Reserve has a natural area over 8,830 hectares with 793 plant species, 266 animal species, of which 44 animal species and 6 plant species are listed in the Vietnam Red Book. Son Tra Peninsula Nature Reserve covers an area of over 4,430 hectares and relatively diversified species with 985 plant species, including 22 rare species, 287 animal species, including 15 rare animal species in need of protection.

For aquatic organisms: Tuy Loan river flows near the road DH2. Overall, the water quality of this river is still good and used mainly for irrigation of the adjacent fields. The public consultation showed that the river has few aquatic resources with some few species of small fishes and shrimps. There is no aquaculture household in the river.

The consulting firm collaborated with the Mid-Central Hydrometeorological Station in sampling aquatic species at the project area for the purpose of preliminary assessment. Specially:

Table 2-17: Aquatic sampling location

No.	Symbol	Sampling location	Coordinates	
			Longitude	Latitude
1	TS1	Aquatic sampling in Tuy Loan, Thach Nham Tay village, Hoa Nhon commune	108° 8'27.46"	16° 0'1.46"
2	TS2	Aquatic sampling at Tuy Loan river, 2500m from Giang bridge to the upstream	108° 7'43.27"	16° 0'13.98"

* *Results of analysis and evaluation:*

Table 2-18: Aquatic samples

No.	Parameter	Result	
		Branch	*Species*
1	**Phytoplankton**	*Bacillariophyta*	*Fragilaria capucina*
			Chaetocerus sp
			Closterium costaum
			Thalassionema frauenfeldii
			Nitzschia brevirostris
			Synedra acus

		Chlorophyta	*Closterium intermedium*
			Endorina elegans
			Pandorina charkoviensis
			Eudorina elegans
			Dictyosphaerium tetrachotomum
			Monoraphidium caribeum Hindák
			Monoraphidium contortum (Thuret)
			Oocystis naegelii Braun
			Oocystis solitaria Wittrock
			Selenastrum gracile Reinsch
			Selenastrum rinoi Komárek and Comas
		Cyanobacteria	*Lyngbya birgei*
			Gomphosphaeria sp.
		Euglenophyta	*Phacus sp*
2	**Zooplankton**	*Arthropoda*	*Acanthodiaptomus* pacificus
			Alonella excisa
			Metapolycope hartmanni
			Daphnia pulex
			Heterocypris repetans
			Hyperia macrocephala
		Mollusca	*Clione antarctica*
			Clione limacina
			Paraclione longicaudata
			Prionoglossa tetrabranchiata
			Acteon candens
			Chrysallida cancellata
			Eulimella nitidissima
			Platydoris angustipes
		Chordata	*Doliopsis bahamensis*
		Bivalviva	*Cyclosalpa affinis*
		Chordata	*Solen sp.*
			Solecurtus cumingianus.
			Solen viridis
			Solecurtus sanctaemarthae
3	**Zoobenthic**	*Mollusca*	*Pomacea canaliculata* L.
			Corbicula sp.
			Pila polita
		Annelida	*Cirratulus cirratus*
			Phyllochaetopterus anglicus

			Glycera abranchiata
			Aricia cuvieri
			Eunoe pallida

Source: Results of environmental monitoring implemented by the Mid-Central Hydrometerological Center on 14 June 2015

Comments:

Through surveys at TS1 and TS2 locations at Tuy Loan river area, 20 species of phytoplankton focusing on 4 major branches, of which the Chlorophyta has the largest number of species (11 species accounting for 55%), followed by Bacillariophyta (6 species - 30%), Cyanobacteriat (2 species - 10%) and Euglenophyta (1 species - 5%). Among them, the Chaetocerus accounts for a relatively large percentage, which shows an encroachment of mangrove in the river system.

Zooplankton at Tuy Loan river are discovered with 20 species under 4 major branches including Arthropoda, Mollusca, Chordata and Bivalviva. Similar to phytoplankton, the zooplankton are quite diverse and abundant with the appearance of salty water species in the group. This shows that the water flow greatly affects the composition and distribution of aquatic plants and animals.

The zoobenthic compositions are more diverse than that in Han river. The analytical result shows 8 species of 2 branches: Mollusca (3 species- 37.5%) and Annelida (5 species – 62.5%). There are no rare species need to be conserved.

2.2. Socio-economic profile of project communes

2.2.1. Economic development at the project area

The road DH2 to be improved and upgraded will pass through two communes of Hoa Nhon and Hoa Son. To determine and evaluate the socio-economic development of communes in the project area, the EIA Consultant carried out a survey to collect data in the people's committees of two communes and directly discussed information with some local people through the consultations. Data mentioned in this EIA report is mainly based on the field survey in June 2015 and collected materials.

According to the survey results, the implementation of the project will directly affect land, trees, crops, housing and structures of two communes.

Hoa Nhon commune is located to the north of the administrative center of Hoa Vang district, with a total area of 32.59 km^2, total population of 14,838 people and population density of 396 people/km^2. The commune has 3 cooperatives for agricultural production, 15 villages including 7 villages along Tuy Loan river bordering Hoa Phu commune, 8 villages along the mountainside bordering Hoa Son commune, 7 village halls recognized as city-level historic vestiges.

Hoa Son commune's location is favorable for trade and services development. The commune has 10 villages with a total area of 24.26 km^2 and population of 12,728 people.

1) Living conditions of households affected by the project:

According to the survey results, out of 48 AHs surveyed, 17 AHs (accounting for 35.5%) have main incomes from agriculture (farming, crops and livestock); the number of the affected households (AHs) having incomes from business, trade is 4 (accounting for 8.3%); 19 AHs (39.6%) have main incomes from governmental salaries and a number of AHs with incomes primarily from profession such as employees or workers…

The professional structure of the people affected by the project in each commune is detailed in the following table:

Table 2-19: Main occupation of households by communes (%)

Sector		Commune		Total
		Hoa Nhon	Hoa Son	
Agriculture	Quantity	8	9	17
	Rate	27.5%	47.4%	35.5%
Aquaculture	Quantity	1	0	1
	Rate	3.5%	0%	2.1%
Trade - Services	Quantity	3	1	4
	Rate	10.5%	5.2%	8.3%
State's civil servants	Quantity	14	5	19
	Rate	48%	26.4%	39.6%
Workers	Quantity	2	3	5
	Rate	7.0%	15.8%	10.4%
Other	Quantity	1	1	2
	Rate	3.5%	5.2%	4.1%
Total	Quantity	29	19	48
	Rate	100%	100%	100%

Source: Resettlement survey, May 2015

* *Income and poverty rate:*

According to the survey result, the incomes of affected households focus mainly on the group with incomes of more than 50 million dong/household/year (52.9%). On the household scale of an average of 3.9 persons/household, each person has an average income of approximately 1.2 million dong/month or more, followed by the next group of households with an income of about 30 - 50 million dong/year (38.7%), which ranges from 750,000 to approximately 1.1 million dong/person/month. The group of households with incomes below 30 million dong/household/year equivalent to below 600,000 dong/person/month on the average accounts for the lowest percentage (8.4%). The average incomes of the local people would be about 40 million dong/household/year, and the per capita income would be 1 million dong/person/month.

According to the Statistical Yearbook of Danang city in 2013 and 2014, the poverty rate in 2013 of Danang city was 0.85%. However, according to the socio-economic reports of the project communes, the poverty rate in 2013 and 2014 of two communes Hoa Nhon and

Hoa Son is shown as below:

Table 2-20: Poverty rate of two project communes

Year	Poverty rate of the project communes	
	Hoa Nhon	Hoa Son
2012	14.4%	16.4%
2013	11.6%	13.37%
2014	5.7%	7.9%

The self-evaluation results of economic conditions shows that 153/175 households (87.4%) surveyed have self-evaluated their incomes at average level; 18/175 households (10.3%) self-evaluated their incomes at fairly good level and 2.3% of the households rated themselves as poor households.

2) Economic development situation of two project communes

a) Hoa Son commune

** Agriculture - Forestry - Fishery:*

Rice production has obtained good results; the rice production area in the winter-spring crop was 155 ha, with the average yield of 60.6 tons/ha and total output of 939.3 tons. Compared with the same period in 2013, the output fell 32.7 tons because the decrease in rice production area by 7 ha for the expansion and construction of Hoang Van Thai road under the phase 4 cemetery project; the rice production area in the summer-autumn crop was 40ha (100% compared to the plan) with the average yield of 55 quintals/ha and the output of 220 tons. Other food crops have grown well and provided high productivity. The total food output converted to paddy has reached 1,383.6/1,498.8 tons (92.3%) compared to the plan assigned by the district. Prevention measures have been intensified and the increase in number of livestock and poultry remained high. The aquaculture area was 5 ha, mainly concentrated in villages An Ngai Tay 2 and An Ngai Tay 3.

** Industry - Small industry and Handicraft; Trade - Service*

The industry, small industry and handicraft tend to develop more. Currently, the commune has 167 plants, factories, enterprises, mechanical processing bases, wood, decorative stone processing workshops which help increase incomes and provide jobs for the people. In addition, the people are encouraged to invest and develop other industries such as mechanical engineering, welding... keeping the average growth rate in the year at 10%

Trade - Services trend towards positive changes. Urbanization process has taken place rapidly, roads have been upgraded and expanded; new markets have been built and upgraded leading to expansion and development of sale business, trade and services in the commune to meet the demands of the people. The total number of households with small-medium-large scale businesses in the commune is 892, providing the average growth rate of 10.3% in the year.

b) Hoa Nhon commune

** Agriculture - Forestry - Fishery*

The total value of agricultural, forestry and aquatic production reached 85 billion dong, accounting for 97.7%, increased by 2.3% against the same period. The total sowing area in the whole year is 560.72 ha, decreased by 13.7 ha, gained 100.8% against the plan. The reason for this is that some area is located in the clearance range for the Danang – Quang Ngai highway project, some area inactive in irrigating water switched to other crops.

The average rice yield reached 61,535 tons/ha in the year, increased by 5.49 kg/ha against the plan although the commune faced difficulties in irrigation, the production field area was covered by the flood in late 2013 and cold weather prolonged in the winter-spring crop affecting the growth of rice plants, the rice in the ear encountered heavy rains and whirlwinds making some area of mid-time rice variety damaged, the blast disease in rice flowering stage developed rapidly and spread over 35 ha of area in the commune villages.

** Small industry and handicraft, trade, services*

The steady growth continues with the total estimated value of small industry of 130 billion dong (102.6% against the district's plan). The production and trading services served primarily in the New Year festival, most products were of various agricultural products, food and consumer goods. Results of annual production of all kinds reached the target. The action plan establishment program for business year 2014 and vision to 2020 has been implemented; marketplaces were reinforced and included with activities to facilitate business for the households.

2.2.2. Cultural – social situation

1) Population

According to the statistics of 2 project communes, general information about the population is as follows:

Table 2-21: Area, population and population density of two communes in the project area

Commune	Natural area (Km^2)	Density (persons/Km^2)	Total HHs	Total population	Total laborers in working age	Total laborers out of working age
Hoa Nhon	32.59	396	3,520	14,838	8,972	5,866
Hoa Son	24.26	562	3,272	12,728	7,358	5,200
Total	**56.85**	**481**	**6,792**	**27,396**	**16,330**	**11,006**

According to the social survey result, a total of 48 households living in the project area all the people in the entire project area are the Kinh group, without the presence of any ethnic minority. The household size is 3.9 persons/household, the proportion of male and female is 54.5% and 45.5% respectively.

Most households have 3 to 5 persons, accounting for 68.7%, followed by households with 2 persons (18.3%), from 6 to 9 persons (11%). The number of one-person households accounts for 2%.

2) Education level

Table 2-22: Educational level of the household head by communes

Location		Educational level					Total
		Primary school	*Secondary school*	*High school*	*College /University*	*Post-graduate education*	
Hoa Nhon	Number of Households	2	8	14	4	1	29
	Rate (%)	6.9%	27.6%	48.3%	13.8%	3.4%	100%
Hoa Son	Number of Households	2	7	9	1	0	19
	Rate (%)	10.5%	37%	47.4%	5.3%	0.0%	100%
TOTAL	Number of Households	4	15	23	5	1	48
	Rate (%)	8.3%	31.3%	47.9%	10.4%	2.1%	100%

Source: Resettlement survey, May 2015

According to the data collected from the households affected directly (partially or wholly) in the road DH2 (Hoa Nhon - Hoa Son), most affected households have relatively high education level. Educational level of members of the affected households in the project area: secondary school education level accounting for 31.3%, high school education level accounting for 47.9%; college/university education level accounting for 10.4%; post-university level accounting for 2.1% and illiteracy/not attending school accounting for 0%.

3) Health, education, communication and sports

a) Hoa Son commune

** Education:*

Schools, classes and teaching equipment continue to be invested for different educational levels. There is a visible change in the quality of education at different levels, the proportion of good students increased, the proportion of average level high school students declined, especially there were no dropouts; In 2014, Hoa Son commune was recognized with 02 national standard schools: Tran Quang Khai Secondary School and Hoa Son Preschool

** Health, population and children:*

Since early this year, there have been 8,579 visitors to the health centers, the expanded immunization, disease prevention, regular food safety examination at markets, food services in the commune and timely environmental sanitation treatment in public areas have been well implemented.

In years 2013 – 2014, there were 789 good students (37.71%), an increase of 3.24% compared to the previous year); 680 fair students (32.5%), decreased by 2.42%, 571 average students (27.29%), decreased by 0.95%, 52 weak students (2.48%), increased by 0.13%.

In 2014, Hoa Son commune performed good work of family planning and completed the plan assigned by the district.

***** *Policy work and care for people who contributed to the revolution:*

The social people have always been paid attention to. Since early this year, the labor and social invalids sector has performed good work of gratitude, paying allowances to the people on time, arranging visits to the policy objects, families that contributed to the

revolution,; Lighting candles to pay tribute and laying wreaths and worshiped for the martyrs day 27 of July.

** Poverty reduction:* The People's Committee of the commune has issued the 2014 poverty escape plan, so far 302/200 households have been out of the poverty line, reached 151% against the plan assigned by the district. At the end of 2014, Hoa Son commune have 300 poor households.

In the past year, the commune has guided 55 especially poor households to prepare dossiers to borrow capital without interest. 02 temporary houses for 02 households in the village ANT1,2 have been replaced with the total budget of 119 million dong funded by the district's Front and individual families; 2,363 health insurance cards have been provided to poor people, people with serious diseases, ethnic households; 103/231 cards have been purchased by near poor households with the State's support; the district's Red Cross provided 05 bulls for very poor households, each bull is worth 10 million dong; electricity bills were supported for poor households.

** Culture and information sector and communal radio station:*

The commune has successfully coordinating with mass organizations to celebrate the Party foundation day February 03; 60th victory of Dien Bien Phu battle; 70 years of establishment of the Vietnam People's Army and major holidays of the year. In late 2014, the district rated 08 Hoa Son commune villages as cultural villages and 2,901 households won the title of cultural families.

b) Hoa Nhon commune

a) Education:

Ending the school year, the education sector has shown new progress, the quality of education has been improved, the percentage of students completing primary school reached 100%; Admission for secondary school students reached 100%.

b) Health:

Continue medical examination and treatment work, carry out the plan for establishment of national standard on the commune health for period 2011-2020. During the year, the communal health center was guaranteed to meet medical needs for people with 16,517 visits. Continued the implementation of disease prevention, especially in collaboration with the relevant units to inspect and provide training in safety and hygiene against food poisoning. Carried out dissemination of population and family planning and application of effective contraception measures. Organized meeting with the health sector officials to celebrate the 60th Vietnam's physicians day 27 of February.

c) Population - family planning, voluntary health insurance:

2,206 voluntary health insurance cards have been provided (1,333 new participants and 873 continuous participants). The associations of Red Cross, Charity, Victims of Agent Orange, Study Encouragement and other non-governmental organizations have actively run and supported in implementing multiple humanitarian and community development programs

d) Labor, Invalids and Social Affairs and Poverty Reduction:

Implemented the policy work and ensure good payment to the beneficiaries of the monthly social policy; handled request records of application for martyrs policy, supported funding for the policy people, people with difficulties, disability and fatal diseases; recognized 03 records of Vietnam heroic mothers; supported in repairing 25 policy houses and building 02 new ones; settled 129 dossiers for policy beneficiaries; provided nursing for 40 people; Arranged survey of martyr's offspring to provide health insurance cards, memory records of Vietnam's heroic mothers.

e) Culture and information – Sports - Radio Broadcasting - Emulation and Reward:

Propaganda activities for "Welcome Party, Welcome Giap Ngo Spring and major celebrations, political and social events". Cultural and art and exciting sport activities have been organized such as 07 night music performances, contests, Chinese chess tournaments held by the district (won the first prize), the 4th public art contest of the district (group prize runner); coordinated with the Youth to organize the camp "drinking water, remembering its source" on July 27 occasion; organize a folk singing contest with the theme "joining hands to build new rural Hoa Nhon commune" responded by many people; Held rating for cultural titles of 2014.

Improved radio stations and broadcasting systems with 20 recorders and 62 loudspeakers in 15 villages. Regularly conducted the dissemination of guidelines and policies of the Party and State's laws, maintaining programs and sections to provide news and information for the people.

2.2.3. Status of infrastructure in the project area

1) Traffic

The road surrounding the Project area have been invested permanently. The roads which are directly linked to the Project include the National highway 14B, provincial road 602, provincial road 604, Hoang Van Thai road, the inter-commune roads 18 and 21. These main roads are service ones to serve transport needs during the construction phase of the Project.

** Provincial road 602 (from Au Co road – Ba Na tourism resort), intersecting with DH2 road at Km9+228,07:*

+ Location: The 27.7km road passes through Hoa Son – Hoa Ninh – Hoa Phu communes. The starting point connects with Au Co road toward the Southwest through the economic, administrative and political centers of Hoa Son, Hoa Ninh communes, connects with Ba Na – Nui Chua tourism.

+ Status: The road is completely invested with scale of main urban road, B_{base} = (5+15+5) = 25m

+ Function: the 602 provincial road serves transport from NH 1A to Ba Na – Nui Chua tourism resort.

** Provincial road 604 (from Tuy Loan – Doc Kien):*

+ Location. The 24.7km road passes through Hoa Phong – Hoa Phu communes. The Starting point at Tuy loan intersection toward the West, through the economic, administrative and political centers of Hoa Phu commune, connecting with Prao town – Dong Giang district – Quang Nam province.

+ Status: Currently, the provincial road 604 has 7.5m roadbase, 5.5m asphalt pavement and now degraded, especially in Doc Kien area where the erosion regularly occurs, causing traffic jams. The on-route works are degraded, which leads to flooding in some sections in rainy season. Currently, the road is being considered to be invested in the section located in Danang city with the scale of urban road, cross section B_{base} = 5+15+5 = 25m.

+ Functions: It is possible to access to Prao town – Dong Giang district – Quang Nam province through the provincial road 604. In addition, the provincial road 604 connects with the National Highway 14B, therefore, it circulates regions in the city and neighboring provinces/cities.

** The road DH1 – Hoang Van Thai, intersecting with DH2 road at Km4+987,65:*

+ Location: Length is 6.97km. The starting point at Hoa My intersection with Ton Duc Thang road (NH 1A) toward the Southwest, connecting to Southern Hai Van tunnel – Tuy Loan road and the ending point at Phu Thuong intersection (the road DH2 – Hoa Nhon – Hoa Son) in Hoa Son commune.

+ Status: Currently, the road is being invested with road base scale of 25m, road pavement of 15m and edge of 2x5.0m.

+ Function: the road DH1 mainly serves local residents, exploits tourism and ensure security and national defense.

Beside, there are inter-commune roads intersecting with the road DH2.

2) Water use and domestic waste collection and treatment at the project area

- According to the survey and consultation with local authorities and households in two project communes – Hoa Nhon, Hoa Son, domestic solid waste of residents is collected daily by the URENCO of the city.

- About 85% of households in two communes are using domestic water supply sources. The other households are using water from bored wells.

- According to the survey, most of households living along two sides of the existing road DH2 have septic tanks.

CHAPTER 3: ANALYSIS OF ALTERNATIVES

3.1. Analysis and comparison between the "WITH PROJECT" Alternative and "WITHOUT PROJECT" Alternative

Comparison between the "WITH PROJECT" and "WITHOUT PROJECT" alternatives is evaluated in the Table 3.1 below:

Table 3-1: Evaluation of the "WITH PROJECT" and "WITHOUT PROJECT" alternatives

Environmental issues	WITHOUT the road DH2 (Hoa Nhon – Hoa Son)	WITH the road DH2 (Hoa Nhon – Hoa Son)
Socio-economic development	**Conflicts between social and infrastructure development may be raised in near future** Transport infrastructure of Danang is relatively synchronous and developed. However, to meet development objectives set forth, the transport infrastructure of the city does not meet development needs in near future, since: - Road density in suburban districts such as Hoa Vang is sparse. Many areas are under the planning with main roads as local roads to be built spontaneously, therefore, it is impossible to create a synchronous traffic network to serve needs of transporting goods and passengers. - Main traffic axes are distributed relatively remotely with main vertical axes as roads managed by the Central Government, including National Highway 1A, National highway 14B, Danang bypass (Nam Hai Van – Tuy Loan road). Roads managed by the local authorities are few, including provincial road 602, Hoang Van Thai road, etc. which have been invested relatively completed whereas other road such as Provincial road 604 (also known as National highway 14G) is now degraded. The connection among main traffic axes is sparse and does not promote capacity of the roads for the development of the regions.	**Resolving conflicts between social development and infrastructure development** The road DH2 will bring positive impacts, contributing to solving outstanding issues related to capacity of transport infrastructure in the West of the city, contributing to the orientation and promoting the finishing of plans. In addition, similar to other urban roads, the road DH2 will also bring direct benefits to the area where the road passes through, including urban justification, improved infrastructure, socio-economic and environmental conditions of the region. Hoa Vang district is a suburban district of Danang city, therefore, the road will contribute to promoting the development of the district through gradual conversion from agricultural land into urban commercial land. Besides, Hoa Vang district has eco-tourism potentials with enormous mountains.

Environmental issues	WITHOUT the road DH2 (Hoa Nhon – Hoa Son)	WITH the road DH2 (Hoa Nhon – Hoa Son)
	Currently, Danang has planned to expand the urban areas toward the East and West of the city. However, due to inconvenient traffic network, immigrants and residents here are still sparse.	
Air, noise and vibration pollution	**Air quality in the urban area is degraded and noise and vibration increase.** Some ring roads are now polluted air, noise and vibration. In future, air quality of urban areas will be affected due to increasing demands of transport.	**Reduced air pollution, noise and vibration for urban areas** When the road DH2 is completed, it will directly reduce flow of vehicles on the ring roads in urban areas, reduce exhaust gas raised in urban areas where there are many sources of exhaust emission from human beings, production and services.
Flood Impact Assessment	The DH2 road without renovation, upgrading and the alignment adjustment in two sections which are often flooded in the rainy season causing traffic jams, traffic difficulties. The main points of flood are near Tuy Loan river from Km0 + 00 to Km2+ 158.39 km2. In addition, the current state of the drainage system of roads has deteriorated, contributing to local flooding at many points on the route.	With the renovation and upgrading of DH2 road by improving the route and adjustment of alignment in two sections which are often flooded, flooding will be minimized considerably. In the long term, there will be positive impacts on transportation, economic development and regional links. This ensures target to reduce traffic pressure for current Hai Van - Tuy Loan avoiding road.
Infrastructure	The population is crowded concentrated in some areas will cause traffic jam points. Drainage system can be defective due to infringement of the right of way. The drainage system will not meet needs and cause local flooding at above points.	The project will bring several benefits to urban areas but negative impacts to rural areas where the road passes through. Elevations of two proposed routes are higher than the existing routes. If the survey and designing of drainage culverts are not thoroughly and exactly implemented, risks of flooding and shortage of water for irrigating for the rural areas are high. Simultaneously, the environmental quality, especially air and noise will be changed due to increasing flow of

Environmental issues	WITHOUT the road DH2 (Hoa Nhon – Hoa Son)	WITH the road DH2 (Hoa Nhon – Hoa Son)
		vehicles.

* *Evaluation of economic efficiency*:

Improvement and upgrading of the road DH2, including investment in synchronous construction of infrastructure will promote socio-economic development of the region, eliminate gaps between rural and urban residents, furnish the regional and city's traffic network.

When the road DH2 is invested, it will contribute to agricultural production, diversification of products, improvement of commodity transportation and improvement of income for local people through reducing costs of production, marketing, poverty reduction and improvement of living conditions for regional people.

* *Evaluation of socio efficiency:*

Beside direct economic benefits, the project will bring great social and environmental benefits to local people, serve accessibility of regional people to the economic and political centers, industrial parks and schools, which contributes to new rural construction.

The road DH2 will contribute to reducing flow of vehicles on urban roads and other link roads (Truong Chinh, Ton Duc Thang roads), which contributes to reducing risks of traffic accidents in locality and reducing flow of vehicles on supporting roads.

3.2. Comparison of Alternatives of the road DH2

- Alternative 1: The DH2 road is renovated and upgraded with expansion road surface from 7.5 m to 10.5 m and the width of sidewalk 5m on each side. Alignment complies with the planning alignment (follows the current road). Do not change the alignment in two sections: section 1 Km0+212 - Km+924 and section 2 from Km1+514 - Km2+355.

- Alternative 2: The DH2 road is renovated and upgraded with expansion road surface from 7.5m to 10.5m and the width of sidewalk 5m on each side. The alignment change at 2 sections: section Km0+212 – Km0+924 and section 2 Km1+514 – Km2+355 as mentioned above:

Evaluation criteria	Alternative 1	Alternative 2 (Selected alternative)
Technical standards	Guaranteed	Guaranteed
Suitable with the planning	Suitable	Suitable
Impacts on resident: + Affected households	+ No. of AHs: 613 HHs	+ No.of Ahs: 666 Ahs (more than alternative 1: 53 hh)
Acquired land on the whole route	Total: 183.168 m^2; in which:	Total : 191.223 m^2, in which:

Evaluation criteria	Alternative 1	Alternative 2 (Selected alternative)
	+Residential land: 44.518 m^2 +Garden land: 29.721m^2 +Agricultural land: 1.510 m^2 +Public land: 107.419 m^2	+Residential land: 50.977m^2; + Garden land: 31.317m^2 ; +Agricultural land: 1.510m^2; +Public land: 107.419m^2 Acquired land is more than that of alternative 1, but area difference is negligible
+ Site clerance cost:	(3.48 US$ mil.)	(3.92 US$ mil.)
+ Benefit level after completing the road:	+ relatively good because the road still exists many narrow bends	+ Good for adjustment position, which will make route more direct and households located in alignment will connect with more favorable route ...
Progress	Average construction period : 24 months	Average construction period : 24 months
Improve flood	Restrict (section Km0+00-Km2+158 is flooded causing seperation	Good, meet the requirement of drainage, flood prevention
Total investment (VND)	**480,457,603,000**	**524,718,145,000**

**** Environmental issues:***

Environmental impacts of the alternatives are assessed on the basis of the status map of the project, general layout drawings and field survey. The areas subject to potential impacts are listed in the table below:

Potential environmental impacts	Alternative 1	Alternative 2 (Selected alternative)	Comparison of two alternatives
1. using land:			
Land use at 2 roads of alignment	Agricultural area, graves, a part of fences of sensitive work.	Agricultural area, a part of hill land, graves, a part of fences of sensitive works Acquired area is more due to not using up current DH2 road at 2 new alignment roads. The route across	Alternative 1 and 2 have impacts on use of sensitive land, agricultural land.

Potential environmental impacts	**Alternative 1**	**Alternative 2 (Selected alternative)**	**Comparison of two alternatives**
		through hills has many households living. - Total recovered land area increase compared with alternative 1 : 8.055m^2, include: + Residential land: 6459 m^2 +Agricultural land: 1596 m^2	
Topography/ geography/elevation	Flat, low-lying land	Natural elevation is higher than Alternative 1	There is no significant difference in potential impacts on landscape. Alternative 2 has more advantages in flood control than Alternative 1. Thus, it's possible to mitigate polluted environment due to flood.
Erosion	River bank erosion should be noted. Road erosion due to flooding is not likely to happen.	River bank erosion should be noted. Road erosion due to flooding is not likely to happen.	Erosion level of two alternatives is similar.
Affected trees/crops	Paddy, cultivation area	Paddy, cultivation area	There is no significant difference in determined impacts.
No. of AHs at road alignment	9 AHs	53AHs hưởng	Alternative 2 has more numbers of affected households due to change of alignment at 2 sections. The section across through hill has many households, thus the number of affected household is more than those of alternative 1.
2. Waters:			
Water quality			There is no significant difference in determined potential impacts.
Hydrology/flooding	The area is prone to flooding, near Tuy Loan river, high water level rise on rainy days.	Flooding level is lower due to higher natural elevation.	Flooding possibility is similar between 2 alternatives. However, level of impact of Alternative 1 is more serious. Alternative 2 mitigates flood due to aligning adjustment at 2 sections which are often flooded in the rainy season.

Potential environmental impacts	**Alternative 1**	**Alternative 2 (Selected alternative)**	**Comparison of two alternatives**
3. Air:			
Air quality	Not evaluate	Not evaluate	There is no significant differences in impact possibility
Sensitive areas may be affected by dust/exhaust gas/ noise	Some sensitive works near roads affected by dust pollution, noise during the construction phase	Some sensitive works near roads affected by dust pollution, noise during the construction phase	The impacts in 2 alternatives are similar.
Other required structures:			
Electric posts, drainage, irrigation and local road will be affected.	Due to expanding and improving the road surface, the drainage system of roads will be affected. The electric poles, transformers substation , will be relocated	Due to expanding and improving the road surface, the drainage system of roads will be affected. The electric poles, transformers substation , will be relocated	The impacts of 2 alternatives are similar. However, for alternative 2, relocation of electric poles and construction drainage system will be more convenient due to 2 sections of alignment are newly built.
Building material access	Excavated soil can be used up to for ground leveling. And use the fill soil from the mines near the work alignment.	Excavated soil can be used up for ground leveling. And use the fill soil from the mines near the work alignment.	There is no significant difference in determined impacts. Both alternatives will similar requirements and sources.
Vision			Height of road in both alternatives will be similar. There is no significant difference in potential impacts.
Construction course			Requirements for retaining wall, backfilling materials, disposal of excavated materials and slope protection of two alternatives are similar. There is no significant difference in determined impacts.

** <u>Selection of alternatives</u>:*

To minimize flood impacts and improve living conditions of the residential areas where the road passes through, and on the basis of evaluation criteria, advantages and disadvantages mentioned above, alternative 2 is selected.

- Alternative 2 is selected as investment option.

- Adjust the height of Hoa Nhon commune administrative center so that the planned height ensures annual flood frequency. Option 1 costs for less compensation and resettlement leading to less social impact but effectiveness of flood prevention is not as high as option 2, thus option 2 is selected to ensure sustainable over flood lasting in the future..

On the basis of above assessments, it is possible to preliminarily conclude that the alternative of alignment according to the option 2 of the road DH2 will cause fewer negative environmental impacts.

CHAPTER 4: ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Environmental Impact Assessment of Options

This section summarizes the potential impacts of the project, basing on the characteristics of the project and the collected environmental database, using the experience in implementing similar projects in our country and the foreign ones and in accordance with the procedures and report forms on environmental impact assessment processes of Vietnam government and the environmental safeguard policies of the World Bank

In general, the operational phases of the project cause different impacts on the environment. The sources of environmental impact on the project are identified in 3 phases:

+ Phase I - Preparation for construction: Making reports on project investment, design, compensation and site clearance, bomb clearance and so forth.

+ Phase II - Construction: Leveling, construction of work items, technical work and installation of equipment and so forth.

+ Phase III - Putting the project into operation.

Environmental impacts are presented as follows:

4.1.1. Negative impacts of the project

The implementation of the road DH2 project will contribute:

- The road DH2 to be improved and upgraded will gradually furnish the ring road surrounding Danang city and create premise of transportation infrastructure for comprehensive socio-economic development in Hoa Vang district and Danang city, attract a significant portion of vehicles travelling on the Hai Van - Tuy Loan bypass, to help ease the traffic pressure on this route and improve safety for transport vehicles in the region. On the other hand, renovation and upgrading the roads will improve significantly frequent flooded situation happening in the rainy season.

- The road DH2 located in the West of Danang city is one of main traffic roads serving needs of travelling of residents in Hoa Vang district. Therefore, the road helps to connect the Northern region to the district Administrative Center and Southern and Southwest regions of Hoa Vang district.

- Attract a large number of laborers; create jobs for local communities living around the project area (trading, masonry, masons, etc.) during the construction and operation of the project. More apartments/houses will be built and densely populated.

However, beside the above-mentioned positive impacts, negative environmental impacts arised from the project are inevitable. These impacts may affect the environmental elements and components, change the landscape, public health and natural resources around the project area. Therefore, it is necessary to analyze and evaluate scientifically and objectively potential impacts as a basis for developing mitigation measures of negative impacts in an effective way.

4.1.2. Generic negative impacts of the project

This EIA report is made using impact matrixes for screening the effects separately by category (physical, biological, social, etc.) and each type of project. These impacts will be determined the specified extent as follows

Table 4-1: Classification of impacts

Sign	Level of impact	Interpretation
N	No impact	
L	Negative impact at a low level	Impact at a low level, on a local scale, temporary effects and self-recovery capabilities
M	Negative impact at a medium level	Impact at a low level in sensitive areas; Impact at the medium level with moderate impacts which can be reversed, mitigated and managed, and take place on a local scale in the interim period of time.
H	Negative impact at a high level	Impact at a medium level in sensitive areas; Impact at the high level with significant impacts on the society and/or the environment, in which some can be reversed and require compensation/reimbursement
B	Positive impact	Create positive changes for the environment and human (living conditions, mental, etc.).

Table 4-2: Preliminary Impact Matrix

Project's activities	Environmentally sensitive elements																			
	Physics								Ecology		Sociology									
	Quality of surface water	Quality of underground water	Quality of sludge, soil	Air quality	Natural flows	Noise	Vibration	Geomorphology / Terrain	Terrestrial Ecology	Aquatic Ecology	Land use	Aquaculture	Tourism and entertainment	Economics	Water / flooding drainage	Traffic safety	Landscape	Historical, cultural and religious relics	Natural resources	Public health
Site clearance	L	L	L	M	L	L	N	L	L	L	H	N	L	M	M	L	M	L	L	L
Exploitation of materials	L	L	N	M	M	L	N	L	L	L	L	N	L	B	N	N	M	N	M	N
Transport of materials	N	N	N	M	N	M	L	N	N	N	N	N	L	L	N	M	N	N	L	L
Warehouse and yard of materials	L	L	L	L	N	N	N	N	L	L	L	N	L	L	N	L	L	L	N	N
Use / maintenance of equipment / machinery	L	N	L	M	N	M	L	N	N	N	N	N	L	L	N	L	N	N	L	L
Traffic jam	N	N	N	M	N	L	L	N	N	N	N	N	N	L	N	N	L	N	N	L
Set up tents (if any), concentration of workers	L	N	N	L	N	N	N	N	N	N	L	N	L	N	N	N	L	L	N	N
Earthwork and pavement for roadbed and road pavement	M	L	L	M	M	M	L	L	L	L	H	L	L	M	M	L	L	L	L	L
Earthworks and building culverts	L	L	L	L	L	L	L	L	N	L	L	N	L	L	M	L	L	N	L	L
Disposal of sludge and dredged soil (if any)	M	L	M	M	L	N	N	L	L	N	H	N	L	L	M	L	M	L	N	L

Project's activities	Environmentally sensitive elements																			
	Physics								Ecology		Sociology									
	Quality of surface water	Quality of underground water	Quality of sludge, soil	Air quality	Natural flows	Noise	Vibration	Geomorphology / Terrain	Terrestrial Ecology	Aquatic Ecology	Land use	Aquaculture	Tourism and entertainment	Economics	Water / flooding drainage	Traffic safety	Landscape	Historical, cultural and religious relics	Natural resources	Public health
Building bridge	M	L	L	L	L	L	L	L	N	L	L	N	N	L	L	L	N	N	L	L
Operation of road	N	N	N	M	M	L	L	L	N	N	L	N	B	B	M	M	B	B	L	L
Maintenance of road	L	N	N	L	N	L	N	N	N	N	N	N	N	L	N	L	N	N	N	L

4.1.3. Assessment of impacts during the project preparation phase

1) Impacts of the land acquisition for the project

In May and June 2015, the resettlement consultant team carried out the socio-economic survey and survey for land/assets affected by the project in Hoa Nhon and Hoa Son communes, Hoa Vang district, Danang city. Regarding the land acquisition from affected households living in the project area, a total of 664 households and 02 organizations (ward/commune People's Committees) will be affected. Figures of each category of land are shown in the table below:

Table 4-3: Summary of Scope of impacts

Items	Unit	Scope of impacts
1. Affected Households (AHs):	***HH***	666
Household members	People	3,037
Of which		
+ Affected Residential Land	HH	411
+ Affected Agricultural land	HH	253
+ Affected other land (managed by the Ward People's Committee)	HH	2
+ Affected houses	HH	276
2. Affected Areas	***M2***	**191,223**
Of which:		
+ Residential Land	m2	50,977
+ Agricultural Land	m2	31,317
+ CPC Land (temporarily assigned)	m2	1,510
+ Other Land (public land)		107,419
+ Affected Housing Area	m2	17,052
3. Physical Relocated households	***HH***	**109**

Items	Unit	Scope of impacts
4. Households whose agricultural land is affected 20% or more of their total landholding (10% or more for vulnerable households).	***HH***	**18**
5. Affected business households	***HH***	**15**

(Source: Resettlement Plan Report)

Entities mentioned in the table above will be compensated for affected land and offered with assistances according to the Resettlement Policy Framework accepted by the Government and WB and approved by Danang City People's Committee under the Decision No. 398/QD-UBND dated 14 January 2013. Affected and relocated households will be provided and compensated in compliance with Resettlement Plan.

a) Impacts of the land acquisition:

A survey including DMS has been carried out for affected people to determine losses of land and fixed assets such as structures, trees, livelihood and community resource access caused by the land acquisition for implementing the project. The project is estimated to acquire land/assets for construction of the road DH2 from Hoa Nhon to Hoa Son (Hoa Nhon and Hoa Son communes, Hoa Vang district). Level of impacts on land is summarized in the table below:

Table 4-4: Summary of impacts on land

No.	Works	Commune	IMPACTS OF LAND ACQUISITION				
			Residential land	**Agri. land** *(used by local people)*	**Land temporarily assigned**	**Public land**	**Total**
A	**Affected households (HHs)**						
1	The road DH2 from Hoa Nhon to Hoa Son	Hoa Nhon Hoa Son	**411**	**249**	**4**	**2**	**666**
	Partly acquisition of residential land		302				**302**
	Wholly acquisition of residential land		109				**109**
	- Below 20% of agri. land			231	4		**235**
	- 20% or more			18			**18**
	- Public land					2	**2**
	Total A						
B	**Affected area (m^2)**						
1	The road DH2 from Hoa Nhon to Hoa Son	Hoa Nhon Hoa Son					**191,223**
	Acquisition of		**50,977**				**50,977**

No.	Works	Commune	IMPACTS OF LAND ACQUISITION				
			Residential land	**Agri. land** *(used by local people)*	**Land temporarily assigned**	**Public land**	**Total**
	residential land						
	- Partly affected		2,965				2,965
	- Wholly affected		48,012				48,012
	Affected agri. land			**31,317**	**1,510**	**107,419**	**140,246**
	- Below 20% of Agri. land			26,006	1,510	107,419	134,935
	- 20% or more			5,311			5,311
	Sub-total B		**50,977**	**31,317**	**1,510**	**107,419**	**191,223**

(Source: Resettlement Plan Report)

b) <u>Acquisition of residential land and housing</u>:

In the design stage, optimal design alternatives have been selected to avoid and minimize the land acquisition for households. Households owning affected structures will be fully compensated in accordance with current regulations of the GoV and Danang city.

Regarding the proposed work item, it is estimated that a total of 666 entities in Hoa Nhon and Hoa Son communes (of which 664 households and 02 organizations – People's Committees of Hoa Nhon and Hoa Son communes) will be impacted with land and fixed assets. Level of impacts on residential land is shown in the table below:

Table 4-5: Summary of impacts on residential land

No.	Works	Project commune	No. of AHs			Affected area (m^2)
			Partly	**Wholly**	**Total**	
1	The road DH2 from Hoa Nhon to Hoa Son	Hoa Nhon - Hoa Son	302	109	411	50.977

(Source: Resettlement Plan Report)

The table above showed that a total of 411 households are impacted with residential land with an area of **50,977m^2**, of which 302 households are affected partly and 109 other households have to relocate for construction of the road DH2 from Hoa Nhon to Hoa Son.

According to the survey, houses in the project area are mostly level 4, temporary, semi-permanent ones because the project area has been planned for a long time. Level of impacts on housing is summarized as follow:

Table 4-6 : Summary of impacts on housing

No.	Works	Commune	No. of Ahs (HHs)			Affected area (m^2)
			Partly	**Wholly**	**Total**	

No.	Works	Commune	No. of Ahs (HHs)			Affected area (m^2)
			Partly	Wholly	Total	
1	The road DH2 from Hoa Nhon to Hoa Son	Hoa Nhon Hoa Son	167	109	276	17,052

(Source: Resettlement Plan Report)

c) Affected works/structures:

Summary of works/structures affected by the project is shown in the table below:

Table 4-7 : Summary of affected works/structures

No.	Works	Commune	Affected structures						
			Kitchen (m2)	Toilet (m2)	Wall (md)	Yard (m2)	Gate pier (cái)	Water tank (m3)	Grave (pcs)
1	The road DH2 from Hoa Nhon to Hoa Son	Hoa Nhon Hoa Son	420	180	3,720	4.470	109	22	53

(Source: Resettlement Plan Report)

d) Impacts on trees and crops:

The site clearance includes clearance and cutting down of trees and crops in two sides for construction and expanding the road DH2. According to the survey, the Project will have minor impacts on trees, crops and agricultural land since the project site is mainly located along the road where residential areas are living. There are only some affected trees including fruit trees and timber trees. However, volume of impacts is minor.

According to the results of inventory, there will be 594 fruit trees, 906 shade trees, 152 ornamental trees and about 32,827 m^2 of crops (paddy) to be affected by the project. Below is summary of impacts on trees and crops:

Table 4-8: Summary of impacts on trees and crops

No.	Works	Commune	Impacts on trees and crops			
			Fruit (tree)	Shade tree (tree)	Ornamental tree (tree)	Crop (m^2)
1	The road DH2 from Hoa Nhon to Hoa Son	Hoa Nhon Hoa Son	594	906	152	32,827

(Source: Resettlement Plan Report)

e*) Impacts on income and business:*

Through the survey at the project areas, it is estimated there will be 15 business households in Hoa Nhon and Hoa Son communes to be affected by the project. (Some

households with frontage houses are trading at home, concentrating in markets in Hoa Nhon commune at intersection with provincial road 602 in Hoa Son commune).

f) Impacts on graves and other cultural works:

For the road DH2 from Hoa Nhon – Hoa Son, the project will affect about 53 tombs in the cemetery. The consultant team conducted consultation meetings with owners of these tombs and local authorities. The consultation results show that they support the project and willing to relocate tombs if they receive adequate allowances.

g) Temporary Impacts:

Despite of measures to minimize resettlement impacts, the project would, during the construction, have temporary impacts, or temporarily limited access to shops, houses and other structures along road sides. There would be also small impacts on fencing wall, fences and other fixed assets during the construction stage. These will be identified and compensated/supported, following the RP which is being prepared.

The construction works are estimated to affect some public works such as electric posts, underground works of the concerned units. Following the RPF, all affected public works will be repaired, rebuilt and restored.

2) Impact by bomb clearance

Bombs, mines and explosives left after the wars shall be carefully cleared in service of the site clearance to build the road and ensure the safety of the works. The area to be cleared bombs and mines is the entire scope of improvement and upgrading of the road located in 2 communes of Hoa Nhon and Hoa Son. This work will be carried out by specialized units of the Army. The process of bomb and mine clearance is usually dangerous to humans and animals accessing the areas in progress of clearance. Therefore, the project owner and the responsible unit shall use protective barriers and warning signs to minimize the possible risks and dangers to people and livestock.

3) Impacts from the site clearance

As mentioned above, houses of households in the project area are mostly the level-4, temporary, semi-permanent one. Impacts on trees and crops are minor. Therefore, the compensation, site clearance is considered as convenient when implementing the project.

The land acquisition will affect the living conditions and income of the affected people. However, these households will be compensated and offered with adequate assistances in accordance with the current policies of the GoV and the WB. Total expense for implementing the Resettlement Plan of the road DH2 (Hoa Nhon – Hoa Son) under the Danang Sustainable City Development Project (Da Nang SCDP) is estimated at VND 88,360,000,000 (Eighty eight billion, ninety million dong), equivalent to $ 4.0974 million. This funding included costs of compensation and assistance for land, assets and structures affected by the project, subsidence assistance, monitoring, evaluation and administration (together with cost for grievance redressing) and contingency. Funding for implementing is taken from the counterpart fund of Danang for the project.

Despite impacts on production, housing and graves of the people in the project area,

the Project will change appearance of the locality, infrastructure, development services, thereby increasing income for households from trading and services, then improving living conditions of the local people.

On the other hand, during the site clearance, some graves (53 graves) will be relocated according to the spiritual customs of locality. For sensitive work, site clearance affects only a partial of Phu Thuong cathedral's fence, other sensitive works which are far from the road, not be affected. Consultant unit accompanies with the representatives of project owner implemented consultation the cathedral and got the support from Phu Thuong cathedral for the project.

In addition, the site clearance works include clearance and cutting down of trees and crops in line with the project. To limit impacts from the site clearance, the Client and the Construction Contractors should allow affected people to reuse types of timber trees and use up the rest (branch and leaves, etc.) for firewood.

In general assessment, level of impacts from the site clearance is minor. The compensation will be strictly implemented for compensating affected households for losses.

4.1.4. Impact assessment during the construction phase

The following specific activities are included in the phase of road construction:

- To concentrate workers and construction facilities and equipment.

- To construct auxiliary items in service of construction such as temporary access, tents for workers (if any), warehouses and yards for construction materials, power sources and water sources for serving the construction …

- To remove layers of surface soil (mixed with organic substances) in two sides of road for expanding the road and transport to the disposal area; To transport soil/sand/gravel from surrounding mines for construction and leveling the road base.

- To construct road pavement, culverts and bridges...

- Relocate electric poles, medium transmission line to a new position, causing temporary interruption for using utility and daily life of residents.

These above activities are reasons and sources of impacting the natural and social environment in the project area.

4.1.4.1. Sources of Waste-Related Impacts

During the construction, sources of pollution are shown in the table bellowed:

Table 4-9: Sources of Impacts and Pollutants

No.	Sources of pollution	Generated waste	Composition of the contaminants
1	- Removal of the sediment muddy layers and the layers of surface (organic) soil. - Operations of the transport means of soil, sand for aggrandizement. - Transport and handling of materials	Dust and exhaust gases	- Exhaust gases SO_x, CO_x, NO_x, VOC, C_nH_m,… are generated - Dust.

No.	Sources of pollution	Generated waste	Composition of the contaminants
	for construction. - Operation of construction machines: Grader, roller, compactor, etc.		
2	Domestic wastewater of the staff and construction workers.	Wastewater	- Wastewater containing biodegradable organic substances, suspended solids, pathogenic microorganisms
3	Overflow stormwater.		- Containing suspended solids (soil, sand, etc.)
4	Water for washing of construction machines, vehicles and tools...		- Containing soil, sand, oil and grease….
5	Generated from the construction: Road base excavation and building road pavement, spreading asphalt and construction of bridges, culverts.	Solid waste	- Waste soil, sludge, building materials (soil, sand, gravel, cement, etc.) are residual and scattered. - Hazardous waste: grease adhesive cloth, viscid oil box, and residual asphalt. Due to not large dimension of bridge, the design consultant designed bridge with small precast abutments; therefore, betonite solution will not be used.
			Brick, rock, porcelain, earth, wood panels...
6	Living activities of the staff and construction workers		- Food scraps, papers, plastic bags, etc.

4.1.4.2. Source of waste-irrelevant impacts

During the construction, in addition to the above-mentioned source of waste-relevant impacts, there are also unexpected impacts as follows:

- Noise generating from the operation of vehicles in circulation and construction machinery;

- High vibration due to construction of the works;

- Impacts on socio-economic lives of people around the project area due to the mechanical increase of population;

- Increased risks of traffic accidents due to transport of construction materials;

- Increased risks of occupational accidents due to fire, explosion or short circuit due to the negligence of workers during the construction of the works.

- Increased risks of local flooding in the project area, especially in the construction site

since during the incomplete construction of longitudinal and horizontal drainage systems, the upgrading and expanding of road will change existing drainage status of the project area.

4.1.4.3. Objects and scope of impacts

Table 4-10: Objects and Scope of Impacts during the Construction Phase

No.	Affected subjects	Scope and time of impact
I. Impact on the natural environment		
1	Air environment	- Impact radius of approximate 200-300m from the centre of the works. - Temporary and interrupted impacts and time of impact only in the construction period.
2	Noise	- Impact radius of approximate 50-100m from the centre of the works. - Temporary and interrupted impacts and time of impact only in the construction period.
3	Water environment	- Possible impact on the quality of surface and underground water around the project area, especially in the days of heavy rain, flood surges causing flooding and water-logging. - Temporary and interrupted impacts and time of impact only in the construction period.
4	Soil environment	- Impact on the nature and structure of the soil due to construction and living activities of the workers.
5	Landscape	- Impact on the local landscape due to waste generated during the construction without timely collection. - Temporary and interrupted impacts and time of impact only in the construction period.
II. Impact on health and life of local community		
6	Workers at the construction site	- Impact on health and life of the construction workers. - Temporary and interrupted impacts and time of impact only in the construction period.
7	People living around the project area and the people in circulation through the project area	- Impact on the health of the local people living around the roads for transport of construction materials. - Temporary and interrupted impacts and time of impact only in the construction period.

4.1.4.4. Assessment of the effects of environmental impacts

1) Impacts on air environment

a) Dust pollution:

The major polluting agent during the site clearance and construction is dust. Dust generated from removal of soil and muddy layers, transport of leveling materials and

construction materials and so forth will pollute the local environment in the project area, buildings, households surrounding and along the transport road.

During the transport, due to wind and vibration, dust from soil and sand in the car and on the road will be whirled by wind, generating dust. Generated dust is much or little, depending on the quality of the road conditions, methods of handling and gathering materials. Dust concentration will increase in the sunny days, scope of dispersal can range up to 200m if you are experiencing the days of strong winds.

**) Degree of dust dispersion from excavation, ground leveling:*

Level of dust generation during the process of leveling depends on volume of excavation, embankment and aggrandizement. Volume of diffused dust is calculated basing on pollution coefficient and volume of excavation and leveling. According to the instruction documents of the World Bank regarding environmental impact assessment *(Environmental Assessment Sourcebook, Volume II, Sectorial Guidelines, Environment, World Bank, Washington D.C 8/1991),* the pollution coefficient E is calculated by the following formula

$$E = k * 0,0016 * \frac{\left(\frac{\bar{u}}{2,2}\right)^{1,4}}{\left(\frac{M}{2}\right)^{1,3}} \quad (1)$$

In which: E - Pollution coefficient (kg/ton).

k - Grain structure with average value of 0,35.

$\bar{u}$ - Average wind speed in the project area.

M – Average humidity of materials.

With the conditions of average grain structure, average wind speed, humidity of leveling materials and so forth, we can calculate the pollution coefficient E = 70.00299 (kg/ton).

According to the basic design of the project, the excavation, backfilling and leveling works mainly take place at the construction site of the road. The volume of excavated and backfilling soil is shown in Tables 1.8. Calculation results are as follows:

Table 4-11: Dust generated from excavation and ground leveling

No.	Name of work items	Total volume of backfilling and excavating soil (m^3)	Q_{dust} (kg/day)	Q_{dust} (μg/s)
1	Road base	533,060.38	49.333	570,898.22
2	Bus stop	1,890.00	0.163	1,887.53
3	Vertical drainage system	2,513.61	0.217	2,510.33

(Note: Specific gravity of soil is 1.3 ton/m^3)

To calculate the dust dispersion concentration generated by ground excavation, backfill and leveling in the project area, the Consultant unit has used Pasquill model by improved by Gifford as follows:

$$C(x,0,0) = \frac{Q}{\pi u \sigma_y \sigma_z} \quad (2)$$

$C_{x,0,0}$: Ground concentration of gases or dust $< 20\mu g$, at distance x (m) far from the source below the downwind $(\mu g / m^3)$.

$\sigma_{y,0}$: ¼ Dispersion width of the section source or line source by axis coinciding with wind direction (m).

Q: The dispersion amount of gases or dust < 20μm from source (μg/s).

σ_y: Cross dispersion coefficient showing dust dispersion amount in horizontal downwind at distance x towards the wind end and at the given atmospheric stability (m).

σ_z: Vertical dispersion coefficient showing dust dispersion amount vertically at distance x towards the wind end and at the given atmospheric stability (m).

u: Wind speed (m/s).

$$u = u_0 \left(\frac{h}{h_0} \right)^n$$

In which: u_0 - The wind speed at the meteorological monitoring station. h_0 - The altitude of the meteorological station and h is the height at the calculation point.

The solar radiation in this area is strong, thus the atmospheric stability is selected as A (very unstable).

By then, σ_y, σ_z is identified for the open area (rural area) using the formula:

$$\sigma_y = 0.22*x\ (1+0.0001*x)^{-0,5} \text{ and } \sigma_z = 0.20*x$$

Based on the dust amount generated from the ground excavation, backfill and leveling for project work items (Table 3.12), the concentration of dust every 1h at earthwork locations is identified as follows:

Table 4-12: Dust emission concentration in air due to excavation and leveling work

X (m)	Dust emission concentration due to excavation and construction of road base ($\mu g/m^3$)	QCVN 05:2013/BTNMT ($\mu g/m^3$)
1.0	96,596.1	300
2.0	92,263.5	
2.5	86,626.8	
5.0	43,250.8	
7.0	23,879.3	
10.0	11,963.9	
15.0	5,337.1	
20.0	2,997.9	
30.0	1,326.4	
40.0	742.6	
50.0	473.0	
60.0	326.9	
70.0	239.1	
80.0	182.2	
90.0	143.3	
100.0	115.5	
110.0	95.0	

X (m)	Dust emission concentration due to excavation and construction of road base ($\mu g/m^3$)	QCVN 05:2013/BTNMT ($\mu g/m^3$)
120.0	79.5	
125.0	73.1	
130.0	67.4	
135.0	62.4	
140.0	57.9	
145.0	53.9	
150.0	50.2	
160.0	43.9	
170.0	38.8	
180.0	34.4	
190.0	30.8	
200.0	27.7	

The result of dust dispersion concentration shows that concentration of dust every 1h at earthwork locations has exceed the standard QCVN 05:2013/BTNMT (limit: 0,3mg/m^3) within the radius of 63m from the center of earthwork locations of the road base and the wind height of about 5m.

However, the dust dispersion concentration decreases very fast by the distance to the source. At distances greater than 63m from the earthwork locations, the concentration of dust generated by earthworks will satisfy the standard QCVN 05:2013/BTNMT.

In general, the concentration of dust generated from the earthworks can affect the air. However, as construction works are often carried out in different stages and not concentrated in one place but scattered on the project site, the actual concentration level will be lower than theoretical calculation. Dust is highly concentrated in the construction area and the objects directly affected are the workers at the site and residents living near the ground leveling locations. The dust is only generated during construction and will disappear upon the construction is completed.

Air pollution caused by dust will reduce upon the application of preventive measures such as spraying water onto the road; thus, the dust pollution caused by transport activities on road is rated at average level. In addition, during the construction, the Investor will require the construction contractors adopt appropriate measures to minimize dust generation.

b) Pollution caused by dust and exhaust gas generation from vehicles:

According to the basic design of the project, volume of organic sludge dredging was 18,583.87 m^3. This unpolluted sludge volume should be generally be dried and reused. In case this volume is not used up, it will be transported to the stockpiles which have been planned for the project. Meanwhile, the insufficient volume of soil to be transported from land mines (Hoa Nhon soil mine, etc.) to the project site is estimated at 250,531.09 m^3 = 325,690.417 tons (*specific gravity of soil is 1.3 ton/m^3*).

The soil mine is 8km far from the project area and the transport road is asphalt one. The average working time of one vehicle is 8 hours/day with average distance of 48km/day (3 trips/day x 2 times x 8km/time). Therefore, the counts of vehicles transporting backfilling soil is 325,690.417/(10x2) = 16.285 counts (average load of vehicle is 10 ton/vehicle).

Conventionally, every 2 non-load vehicles are equal to one on-load vehicle. Therefore, total counts of vehicles for transporting leveling soil is 16,285 + (16,285 / 2) = 24,428 counts of vehicle.

Depending on the road quality and methods for carrying, loading, unloading soil and gathering materials, the pollution level is generated more or less. The concentration of dust will increase on sunny days and dry windy days.

The calculation of dust load during transport is as below:

$$L = 1{,}7K\left[\frac{s}{12}\right] x \left[\frac{S}{48}\right] x \left[\frac{W}{2{,}7}\right]^{0,7} x \left[\frac{w}{4}\right]^{0,5} x \left[\frac{365 - p}{365}\right] \quad (3)$$

In which: L : Dust load (kg/km/turn/year);

K : Grain size (0,2);

s : Amount of soil on the road (8,9%);

S : Average speed of vehicle (50 km/h);

W : Laden weight of vehicle (10 tons);

w : Number of wheels (6 wheels);

P : Number of working days/year, P = 288 days.

Result of calculated dust load generated from transport vehicles of leveling soil is 21.942 kg/day on average. However, dust pollution will reduce because the quality of traffic road around the transport area is quite good and the construction unit and the project owner will take anti-pollution measures such as watering for roads, cleaning for premises, humidifying for raw materials and so forth.

On the other hand, in order to assess the levels of dust and exhaust gas pollution due to the transport vehicles and using of fuel during the construction process, the consultant uses a table of pollution coefficients of diesel-driven vehicles according to the Handbook of Emission, Non-Industrial and Industrial source, the Netherlands shown in Table 3.14 below

Table 4-13: Pollution coefficients of diesel-driven vehicles

Components	Dust	SO_2	NO_x	CO	VOC
For the vehicles weighing less than 3.5 tons:					
Pollution coefficient (kg/1.000km)	0.020	0.116*S	0.07	0.1	0.015
For the vehicles weighing from 3,5 to 16 tons:					
Pollution coefficient (kg/1.000km)	0.90	4.29*S	11.80	6.00	2.60

Source: Handbook of Emission, Non-Industrial and Industrial source, Netherlands

*Note: * S means content of sulphur in diesel from 0.5 – 1.0%.*

On the basis of category and quantity of vehicles with average operating hours of 8h/day, average transport distance of 48km/day (3 trips/day x 2 times x 8km/time), the

calculation results of dust and exhaust gas by each kind of vehicles are shown in the table below:

Table 4-14: Emissions of diesel-driven transport vehicles

Components	Dust	SO_2	NO_x	CO	VOC
For the vehicles weighing less than 3.5 tons:					
Load of emissions (g/day.vehicle)	0.8	0,023	2.8	4	0.6
Load of emissions (µg/s.vehicle)	27.8	0.8	97.2	138.9	20.8
For the vehicles weighing from 3.5 to 16 tons:					
Load of emissions (g/day.vehicle)	36	0.86	472	240	104
Load of emissions (µg/s.vehicle)	1,250.0	29.8	16,388.9	8,333.3	3,611.1
Emissions of dust and exhaust gas generated from means of transport (g/day)	*1.868,7*	*31,28*	*14.239*	*8.792,4*	*3.905,2*

Dust and noise caused by transport vehicles affect the communities living along the road. Increase in the density of vehicles traveling on the road can result in traffic accidents, traffic jam and degradation of road quality. Dust together with NO2, SO2, CO, THC and VOC emissions from transport vehicles will pollute the surrounding air, increase greenhouse effect, affecting air quality, which will impact on the environment, human being and creature.

However, in reality, transport vehicles circulate on different roads, depending on locations of work items and in different moments but not concentrate in a certain area. Process of exhaust emissions occur on the running path of vehicles and the project area has an average wind speed of 2,3 m/s, therefore, the exhaust emissions will easily spread far and do not cause serious impacts. The project owner shall require the construction contractors to take effective measures to minimize pollution of exhaust emissions from transport vehicles as specified in Chapter 4.

For excavator, grader and bulldozers, etc., because there are a few devices and it is not concentrated in a certain area, it can be realized that the amount of waste emissions from burn fuel oil of these machinery is small.

The above-mentioned sources of pollution are temporary, intermittent, dispersed and depending on the intensity and duration of construction, number of motorized vehicles, and flow of people. Therefore, the impact on the environment is not great. At the same time, during the implementation process, the Employer requires the construction units to implement mitigation measures to limit pollution.

c) Noise pollution caused by operation of transport vehicles and construction machinery:

During the construction phase, in addition to the above-mentioned impact on the air environment, noise is also an element of physical nature and affects the regional air environment. It mainly generates from the construction machinery, heavy trucks, generators and so forth.

Noise generating from the construction process is generally discontinuous, depending on the type of operation and the machinery and equipment used.

To calculate the radius of influence of the noise, the Consultant uses the Mackerminze formula, 1985 to calculate noise levels:

$$Lp(X) = Lp(X_0) + 20lg(X_0/X)$$

In which:

$Lp(X_0)$: Noise level being 1m far from the source (dBA)

X_0 : 1m

Lp(X) : Noise level at the location to be calculated (dBA)

X : Position to be calculated

Table 4-15: Calculated results and predicted noise levels of the project area

No.	Type of machine	Noise level being 1m far from the source		Noise levels corresponding to its distance					
		Approximate	Average	5m	10m	20m	50m	100m	200m
1	Trucks	82- 94	88	74.0	68.0	62.0	54.0	48	42
2	Traveling cranes	76- 87	81.5	67.5	61.5	55.5	47.5	41.5	35.5
3	Generators	72- 82.5	77.2	63.2	57.2	51.2	43.2	37.2	31.2
4	Air compressors	75- 87	81	67.0	61.0	55.0	47.0	41.0	35.0
Vietnamese code 26:2010/BTNMT: Noise in public and residential areas: 55 - 70dBA (6 - 21h)									

High-intensity noise will affect human health such as insomnia, fatigue, psychological discomfort. It also reduces labor productivity of workers on the site, making them difficult in mental focus, easily resulting in occupational accidents.

The calculation results above showed that noise level gradually decreases per distance to the source point. On the other hand, when vehicles operate, the acoustic resonance will happen with real acoustic strength 3-5% higher than values in the above table. Thus, at a distance more than 50m from noise source, noise level passes limits regulated by QCVN 26:2010/BTNMT, impact level is considered as minor and staff and workers are subject to these impacts during the construction.

2) Impacts on water environment

During the construction phase, the sources of wastewater are mainly domestic sewage of workers, water pumped from the pit of the works, water used to wash construction machines & equipment and stormwater runoff through the surface of the project area.

a) Pollution caused by domestic sewage of workers

Domestic sewage of workers at the construction site is a major cause of affecting water quality of the surrounding area. It many impurities, easily decomposable organic substances, nutrients and malignant bacterium, possibly resulting in contamination of surface water and ground water if not being treated promptly.

Based on the amount of pollutants in the report on current situation of urban wastewater - Institute of Environment Science and Technology - Hanoi University of Technology in 2006, the amount of pollutants daily released into the environment by each person is given in the following table:

Table 4-16: Amount of pollutants daily released by each person

No.	Pollutant	**Amount** (g/person/day)
1	BOD_5	45 - 54
2	Suspended solid	70 - 145
3	Animal fats and vegetable oil	10 - 30
4	NO_3^- (calculated according to Nitrogen)	6 - 12
5	PO_4^{3-} (calculated according to phosphor)	0,8 - 4,0
6	Coliform	10^6- 10^9 MPN/100ml

Source: Report on current situation of urban waste water - Institute of Environment Science and Technology - Hanoi University of Technology in 2006

Total number of workers involved in the construction of the project works ranges between 100 and 120 people. However, these work items are often not constructed continuously and in the same time so in the peak time, there are approximate 100 workers in one day. With the water usage of 100 liters/person/day (According to Construction Standard 33-2006), the amount of generated wastewater equal to 85% of the water supply (85 liters/person/day), total amount of domestic wastewater generated daily at the site is approximate 5.1 m3/day. Load and concentration of pollutants in domestic wastewater in the project construction area is calculated based on the amount of pollutants, the number of workers, wastewater flow, the results of which are shown in the table below

Table 4-17: Concentrations of contaminants in domestic wastewater

No.	Contaminant	**Load of contaminants** (kg/day)	**Concentration of contaminants in waste water before treatment** (mg/l)	**Vietnamese code 14: 2008/BTNMT** (column B)
1	BOD	2.7 - 3.24	529 - 635	50
2	TSS	4.2 - 8.7	824 – 1,706	100
3	Animal and vegetable oil and grease	0.6 - 1.8	118 - 353	20
4	NO_3^- (according to nitrogen)	0.36 - 0.72	71 - 141	50
5	PO_4^{3-} (according to phosphorous)	0.048 - 0.24	10 - 47	10
6	Coliform	$60x10^6$ - $60x10^9$ MPN/100ml		5,000 MPN/100ml

It is shown in the calculated results in the above-mentioned table that pre-treatment domestic wastewater has much higher concentration of contaminants than the rating in the Vietnamese code 14: 2008 / BTNMT (column B). If no daily collection and treatment system is constructed and installed, the huge amount of contaminants is discharged into the environment. This is a significant source of pollution, directly impacting on the living environment of the workers and the people living around the project area, causing epidemics and causing direct effects on the environment of underground and surface water, relevant to

which the project owner will take the appropriate remedial measures specified in Chapter 4.

The construction workers mostly hire houses in the residential area near the project area, therefore, they share toilets with landlords. Therefore, volume of wastewater generated at the construction site is much lower than calculation. These toilets will be equipped with sanitary equipment to minimize impacts on the regional water environment.

b) Pollution caused by construction sewage:

During the construction, wastewater is generated from washing of materials, equipment, machinery, concrete curing, washing of wheels and so forth. This type of waste water is characterized by highly contained suspended solids and organic substances. Its composition is listed the following table:

Table 4-18: Concentration of contaminants in construction wastewater

No.	Indicator	Unit	Construction waste water	Vietnamese code 40:2011/BTNMT
1	pH	-	6.99	5.5 - 9
2	SS	mg/l	663.0	100
3	COD	mg/l	640.9	100
4	BOD_5	mg/l	429.26	50
5	NH_4^+	mg/l	9.6	10
6	Total N	mg/l	49.27	30
7	Total P	mg/l	4.25	6
8	Fe	mg/l	0.72	5
9	Zn	mg/l	0.004	3
10	Pb	mg/l	0.055	0.5
11	As	μ mg/l	0.305	100
12	Oil and grease	mg/l	0.02	5
13	Coliform	MPN/100ml	53×10^4	5,000

Source: Centre for Environmental Engineering of Towns and Industrial Areas (CEETIA), Hanoi University of Civil Engineering (HUCE)

It can be shown in the results of the table above that some quality indices regarding the construction sewage of the project ranges in the permissible limits of the Vietnamese code 40:2011/BTNMT – National technical regulation of industrial waste and the indices of the larger suspended solids, COD, BOD_5 and Coliform are 6,6 times, 8 times, 8.6 times and 106 times higher than the permissible limits respectively. Although the amount of water is not much, it will still pollute sources of surface and underground water as well as workers' health if not being collected, treated but discharged directly into the environment

c) Pollution caused by run-off stormwater:

Quality of run-off stormwater depends on purity of atmosphere and washable substances in the layout of the project area. Run-off stormwater volume depends on weather

conditions of the region. When it rains, stormwater run-off through the project area will entrain soil, sand and waste into surrounding roads, ponds and lakes.

In the area of construction works, the quality of overflow waste stormwater sources only depends on the surface of the construction site because the current state of the air environment's quality of the project area is quite good, possibly making sources of stormwater polluted in the area.

Contaminants in overflow stormwater in the construction phase mainly consist of suspended substances, the oil and grease of which are swept away by stormwater. In particular, during this phase, the surface of construction plan is unfinished, easily resulting in washout and erosion of surfaces.

In order to limit contamination of overflow stormwater, the construction units need thorough collection of scattered materials and waste oil and grease of vehicles and machinery in the construction process. As a result, stormwater will not wash away many contaminants into the surrounding water sources, therefore, the impact is insignificant.

d) Water pollution caused by sludge dredging:

Dredging of sludge will be implemented mainly at the construction sites through the agricultural cultivation area, soft-soil area and axle, etc. According to calculation data of design consultant, total volume of organic sludge to be dredged is about 18,583.87m^3. Whereas, analytical results showed that sludge/sediment here is not polluted, therefore, the Client and Construction Contractor can dry sludge and reuse for leveling the layout.

Sludge dredging will increase turbidity and dispersal of contaminants, causing impairment of water quality in canals and rivers. Dredging levels of a construction segment (depth of 2 - 2,5 m, length of 20m), volume of dug-up soil of approximate 0,2m3 will be likely to generate alum, resulting in aluming and invasion, polluting rivers, canals and ditches. Concentrations of contaminants increase insignificantly in the distance of more than 100 meters far from the dredging location, therefore, the impact is considered small. However, during the dredging, following concerned should be paid attention:

+ Not dredge beyond the scope pre-described in design;

+ Not implement any activities other than dredging;

+ Ensure hygiene for the surrounding area, not litter waste disorderly;

+ Minimize volume of scattered sludge to avoid complaints from residents and pollution to the receiving source.

3) Impacts on land environment

During the construction phase, the excavation, embankment, leveling, and construction of technical items of the project will alter the natural flow regime, easily resulting in soil erosion in cases of heavy rains. Wastewater mixed with oil and grease (not much) together with stormwater running into the surrounding areas will reduce the quality of soil in the area, especially agricultural land in low-lying areas.

Especially, in the construction process, because there has not been a complete drainage system in the project area yet, local flooding will happened and the influence on the quality of the soil environment increase. At the same time, the earthmoving, land compaction…. will change the physio-mechanical properties of the soil.

4) Impacts of solid wastes

a) Domestic solid waste:

During the construction, domestic solid wastes generating from the workers' activities mainly are nylon bags, waste paper, food packs and so forth.

Table 4-19: Components and general density of domestic solid wastes

No.	Components	**Weight ratio** (%)	**Volume** (kg)
1	Paper, packing, rice box…	30	3.6 - 4.8
2	Putrescible matter (animals and plants)	25	3.0 - 4.0
3	Glass	12	1.4 - 1.9
4	Plastics	10	1.2 - 1.6
5	Metals	6	0.7 - 1.0
6	Fiber pulps	2	0.2 - 0.3
7	Other inorganic substances	15	1.8 - 2.4

Source: Center for Urban Environmental Engineering and Industrial Area – University of Construction of Hanoi

It is estimated that each worker working in the project area generates approximate 1 kg of domestic waste per day. At the peak time of construction, the project area is estimated to have approximate 60 workers in each day. Therefore, total amount of waste generated from daily activities is estimated to be 60 kg/day, which will impact on surface water, ground water, causing unpleasant stench in the project area due to the decomposition and sweeping-away of stormwater, if not being effectively managed and collected. The difficultly decomposable inorganic wastes like bottles, nylon bags and other items existing in the water will cause unaesthetic, affecting water quality and reduce the possibility of diffusion of oxygen into the water, which impacts aquatic life.

b) Construction solid wastes:

Solid wastes generating during the construction are mainly: cement bags, grout spillage, rubble, scrap steels and so forth. The volume of generated solid wastes is dependent on many factors as the construction and project management regime, the supply of building materials, etc., therefore, it is difficult to estimate accurately load of waste sources. It can be controlled by collection for recycling or sales of scraps.

However, basing on the experience in construction of some similar works, the employer commit that the waste sources cause no major impact on the regional environment and the mitigation measures taken for this waste sources can radically reduce pollution levels as well as the volume of waste sources generating into the surrounding environment.

In addition, amount of soil creating from the excavation of foundation pit is also significant. It can be used for embankment, backfilling around the foundation pit and landfilling of the foundation pit in the future.

c) Hazardous solid wastes:

- Maintenance of facilities, vehicles, and machinery in service of construction can also generate residue oil, oil bottles and containers and oil rags and forth if it is done rightly on the construction site but not collected and treated, which will affect the landscape and pollute the

surface water and ground water in the project area. However, the Employer will take measures to collect and treat it according to the regulations on hazardous wastes to minimize negative impacts on the local environment. According to the general statistics from several similar projects, volume of solid waste is generated irregularly with volume of 10-12 kg per month. This volume of waste will be transported and disposed by the functional unit which signs contract with the Client and Construction Unit.

- On the other hand, another hazardous waste source during the construction of road is residual asphalt during the spreading asphalt..

+ Asphalt is a liquid or semi-solid with highly viscosity and black color. Asphalt is a petrochemical product, it may danger or cause adverse impact on the environment and human health if it is not properly stored and used according to technical processes. In particular, if the compact asphalt is regularly stored at high temperature, it can cause the risks of fire, explosion or burning during the transport and using. Essential component of asphalt is bitumen.

Therefore, it is required to collect and store residual asphalt in dedicated tanks of hazardous waste. The Client and Contractor need to hire an agency for transporting and treatment in accordance with regulations on hazardous waste management to prevent risks of environmental pollution. The construction unit should not let asphalt scattered into soil and water source in two sides of road to avoid pollution.

5) Socio-economic Impacts

a) Disturbance to local community:

During the construction in the project area, the gathering of construction machinery and 100-120 labors at the construction site will cause certain disturbance to the area, in particular:

- Demand for regional goods such as food and utensils will increases.

- The relationships between the workers at the construction site and the local people will arise. Possibility of conflict between the workers and the local people will be higher if the workers are those who come from other regions do not understand the customs of the local people.

- During the construction, the concentration of a large number of workers will increase the risk of social evils (gambling, theft, drug addiction, prostitution, etc.) and order and security situation will become more complex and difficult to control, making it difficult for the local police.

- In addition, the concentration of workers in the construction area will also contribute to appear and spread outbreaks of waterborne diseases (cholera, dysentery, typhoid, diarrhea) or through intermediate vectors (fever malaria, dengue, etc.) as well as social diseases (gonorrhea, syphilis, HIV, etc.), affecting the health of the local communities. This effect will be likely to occur if no management and control measures are taken.

- On the other hand, the construction and improvement of the road can affect production activities of 25 households in the stone dressing traditional villages in two communes of Hoa Nhon and Hoa Son due to impacts on transportation of stone to traditional village and finished products to consumption place. After the road is completed, it will facilitate production and trading acitivities.

b) Impacts on health and safety of workers and local people:

- Increased circulation of transport vehicles of construction materials and heavy machinery will affect the safety of the drivers and the road users on the transport roads.

- Generation of dust and noise from the vehicles in circulation can seriously affect human health directly or indirectly through food. Pollution-based pathogen can spread immediately or accumulate for a period of time and then appear.

- In addition, during the leveling and construction, the fires of temporary electrical systems, explosion of fuel depots and so forth as well as the channel dredging, excavation and embankment of roadbeds can cause landslides and subsidence of adjacent buildings, effects on the underground water level.

Besides, the Employer and the contractors will work closely with the local governments in the project area and the relevant agencies to promptly solve the arisen problems in accordance with the state regulations the people's aspirations.

The construction units will set up temporary or hire the local people's houses for their workers to sleep, stay and rest in the far distance from the construction site, therefore, dust, exhaust gases, noise, soil and rock of excavation and leveling, etc. will have no impact on the health of construction workers in their leisure time.

The effects mainly occur when the workers are present on the construction site. However, the construction workers are arranged to work in shifts in the construction site with appropriate works and issued suitable protective cloths, equipment so the impact levels of waste such as dust, emissions, noise can be reduced are controlled.

Sewage and garbage of the construction workers can be pathogenic sources for them if not being collected and treated appropriately.

On the other hand, soils and rock excavated and backfilled during the construction can cause accidents (slip, trip and fall, etc.) for the construction workers if being not removed to the appropriate locations.

6) Impacts on culture work and religious

During the operation phase,close lo cation of culture work, religious to the road, so impacts on pollution such as: dust, noise, solid waste and local traffic congestion are unavoidable. However, these impacts are temporary and it is possible to mitigate impacts through proposed measures in chapter 5. The impact on site clearance due to relocating 53 graves and affecting fences of Phu Thuong cathedral mentioned in the pre-construction phase.

7) Other impacts

a) Local flooding at the project area in heavy rains due to construction of road.

During the construction phase, In this phase, the systems of horizontal and longitudinal culverts are not completed, the local flooding in residential complex and low cultivating fields near the road may occur.

In addition, some cultural and education sites of Hoa Nhon, such as Hoa Nhon Primary School No.1, Hoa Nhon commune medical station, Hoa Nhon market, Hoa Nhon Primary School No. 2 and Victims of Agent Orange Care Center; Phu Ha village hall, Phu Ha temple, Hoa Son Primary School No. 1, Loc Quang Pagoda, Phu Xuan Temple, Phu Thuong church and Hoa Son commune martyrs cemetary and the residential areas of villages of Phu

Thuong, Phu Ha, Xuan Phu and Tung Son in Hoa Son commune and villages of Phuoc Hung, Phuoc Thai, Thach Nham Tay, Thai Lai and Phu Lai in Hoa Nhon commune, Hoa Vang district, Danang city also are at risk of being affected in case of heavy rains.

This issue is short-term and mitigated through the construction methods implemented by contractor, such as building of drainage ditches and temporary culverts for drainage purposes.

In addition, in case of prolonged heavy rains, it can cause flooding and overflow through the route. This will cause dangers to human and properties as well as auxiliary works on road, simultaneously affect water quality due to water's washout of pollutants and residues.

To minimize risk of flooding, the design consulting firm should design roadbase reinforcement at appropriate elevation and build several longitudinal and horizontal sewers for timely drainage in case of heavy rains. On the other hand, it is required to place signs and direct residents to travel on other road in case of heavy rains

b) Risks and incidents during the construction phase

During the construction of road and auxiliary works, some potential risks and incidents include labor accidents, traffic accidents, fire, explosion and falling down due to subsidence. Such cases may affect health and life of workers and local people living nearby the construction location.

c) Landslide impact of constructing road on hills

Section Km1+514 – Km2+355 the DH2 road will cut through a low hill slope (an average height of 12,8m) with the length of 829,554m. The height of the road increases gradually from 8,5 to 17,3, then reduces 9,4. Through Geological Survey of design consultants, road ground crossing this hill is pretty sure which is suitable for the construction of the road. Subsidence and landslides as well as the construction of pavement layers have occurred but not considerably during the construction process and it may be reduced.

4.1.5. Impact assessment during the project operation phase

4.1.5.1. Pollution sources, objects and duration of impacts

During the operation of the project, the pollution sources, objects and duration of impacts are specified as follows:

Table 4-20: Pollution sources, objects and impact duration of the project

Activities of the project	Causes of Impacts	Environmental impacts	Affected objects	Impact duration
Road traffic	- Emissions and noise of motor vehicles running on roads. - Waste discharged by drivers or passengers on road	Environmental pollution due to emissions, noise, vibration...	- Air environment. - Health of residents. - Lost aesthetic of road	Long-lasting

Activities of the project	Causes of Impacts	Environmental impacts	Affected objects	Impact duration
Raising elevation of roadbase	Roadbase elevation is higher than the surrounding area.	Roadbase elevation is higher than the people's house floor, making it difficult for local people to travel and causing local flooding in case of heavy rains. Low-land positions are prone to be locally flooded in case of heavy rains.	Health and safety of the local people.	Long-lasting
Environmental incidents	Risks due to improper maintenance operations. - Risks of traffic accidents	- Increasing pollution, grease, turbidity and solid waste - Harm the lives of workers and the local people	- Humans and properties - Public health. - Environment, air, water and soil.	Temporary

4.1.5.2. Assessment of effects of environmental impacts

1) Impact of dust and traffic emissions:

When the project goes into operation, it will increase the traffic of vehicles running along the bridges and roads. This will be a source of pollution due to emissions.

During the operation, these vehicles which are mainly fueled with gasoline and diesel will discharge into the atmosphere a relatively large amount of exhaust fumes containing pollutants such as NO_2, CO; CO_2, and so on. The concentration of these gases depends on the density and types of vehicles running through the project area.

2) Impact of noise and vibration:

Noise and vibration are mainly caused by means of transportation. Different vehicles will generate different noise levels. For example, a small passenger car has a noise level of 77 dBA, truck - coach: 84- 95 dBA, motorcycles: 94 dBA... The noise levels of motor vehicles are shown in the table below:

Table 4-21: Noise level of motor vehicles

Vehicle type	Noise Intensity (dBA)	Noise standard in residential areas Vietnamese code QCVN 26: 2010/BTNMT	
		Daytime (dBA)	***Nighttime (dBA)***
Passenger car	77	70	55
Mini bus	84		
Sports car	91		
Truck	93		
4-stroke motorcycle	94		
2-stroke motorcycle	80-100		

Source: Pham Ngoc Dang, Air Environment, Science and Technology Publishing House, Hanoi 1997

The data in the table above shows that most of the traffic activities generate greater noise than the permitted standards in residential areas. Therefore, it is necessary to take appropriate control measures.

3) Risk of traffic accidents

As the work items are put into operation, they will increase the traffic of vehicles running through the road and bridges. On the other hand, during the process of repair and maintenance of the works, many vehicles and machines are concentrated. That will pose a risk of traffic accidents for drivers and traffic participants. This is unavoidable, so the propaganda should be promoted for traffic participants to strictly abide by the Law on Road Traffic Safety to reduce possible unfortunate incidents.

4) Socio-economic impacts

- The project will create jobs for many workers of different professions in the area as the works goes into operation, it will create favorable conditions for the development of trade, exchange of goods and services between the communes in the project area and the neighboring communes in Danang city as well as the surrounding areas. In addition, many restaurants and auxiliary works... will be risen up along the new roads.

- The project will contribute to improving the technical infrastructure of the city synchronously; Landscaping good environment, contributing to improving the quality of life, cultural and spiritual life of the people; As well as motivating the development of the city, contributing to improving the urban interface, promoting the urban and regional development.

In summary, the comparison between benefits and damages can see that the benefits provided by the project are very practical and meaningful. The above negative impacts can be controlled and solved.

4.1.6. Effects of climate change to the project area

Vietnam is one of the five countries which are most heavily affected by climate change and sea level rise. While Danang city is a coastal city, located in the central region of Vietnam, often suffers damages due to extreme weather phenomena. Climate change is

mainly caused by the increase of the average air temperature, causing an increase in the intensity and frequency of natural disasters (thunderstorms, tornadoes, heavy rain...). Prolonged deep inundation or drought, together with landslides, saline intrusion, besides the effects of climate change, involves the responsibility of humans. Therefore, stabilizing lives and livelihoods for the community and develop and invest in the infrastructure to mitigate the negative impacts and adapt to climate change is an urgent task for Danang city at the present and in the future.

The effects of climate change in Vietnam in general and Danang city in particular are very clear. In the past 50 years, the average temperature has rise, on average 0.5°C/year, rainfall tends to increase. Under the scenario of medium discharge, in middle of the 21st century, the majority of Vietnam land, including Danang city has an annual average temperature increase of 1.2 - 1.6°C. Meanwhile, the popular increase of the annual rainfall is 1-4% by the mid-century. In terms of sea level, in 2020, the sea level of the area will rise by 7-9cm, in 2050 it will rise by 20- 27cm and at the end of the century, the sea level will rise by 49-77cm. These changes alter the morphology of weather patterns and exacerbate the types of natural disasters and increase the intensity and frequency of unusual natural disasters. The impacts of climate change are as follows:

- Increasing the average temperature and the number of hot days during the dry season;
- Increasing the rainfall at the end of rainy season, changing rainfall distribution;
- Increasing the number of days with unusually heavy rainfall (> 100 mm);
- Sea level rise leading to flooding, saltwater intrusion;
- Rising tide....

In reality, the infrastructure, residential and urban centers... in the project area, especially near the rivers and canals are very susceptible due to the impacts of climate change and environmental pollution. The poor are often in danger because they live in uncertain places and did not have enough conditions for post-disaster repairs. Moreover, the access to adaptive technology and institutional support is still limited, making them more vulnerable.

To mitigate the negative impacts of climate change and sea level rise on Danang city, the investment in the construction of urban infrastructure (improvement and construction of roads, bridges, dikes, water supply and drainage systems, etc.) plays an essential role in helping Danang city adapt to climate change, meeting the needs of urbanization and sustainable socio-economic development.

For the project, the impact of rain, high tide and sea level rise will greatly impact on the construction and operation of the project. The main impacts of climate change on the operations of the project are as follows:

1) For the construction phase:

- The number of rainy days with unusual precipitation increases, affecting the construction, water drainage capacity and causing partial flooding due to the temporary failure of the water drainage system.
- High tide and heavy rain will cause flooding in the construction areas and material storage. Flooding water will cause unsanitary condition for the construction site, especially for the work items in alleys and sewers.
- Partial flooding in the construction work items of the project causes not only materialistic damages (building materials), but also impacts on the environment and the area landscape and the daily life of the people in the project area…

2) For the operation period:

Superstructure of Da Nang city is higher than the average sea level; however, according to A1FI climate change scene, flood level remains high (scenario of high level of fuel exhaust). Flooded area due to sea rise in 2020, 2050, 2070 and 2100 will be 2.4, 3.2, 4.2 and 5.8 km2 relatively (counting for 0.3 -0.6 total city area). Flooded areas locate in Hai Chau, Son Tra and Ngu Hanh Son districts. Currents of flooded area are strongly affected by tide of Da Nang Bay.

Although DH2 road is not significantly affected by sea rise and climate change, it (Hoa Nhon - Hoa Son sections) is built based on calculation of appropriate code design which is higher than flood level in the A1FI climate change scene. Average code of DH2 road varies from 2.5 – 30 m (higher than sea level). The existing road has 2 sections (a section from Km0+212 – Km0+924 and a section from Km1+514 – Km2+355) locating in lowland which is regularly flooded. Therefore, DH2 road design is adjusted to minimize flood:

+ Section from Km0+212 – Km0+924: left turn from existing section, crossing agricultural land area.

+ Section from Km1+514 – Km2+355: right turn from existing section, the new section crosses a hill. By survey, no rare creatures living in the hill.

According to the new plan, DH2 road helps to settle the flooding situation

4.2. Commendation on level of detail and reliability of the assessment

4.2.1. Methods applied in EIA

Depending on the nature of each research methodology, application conditions and qualifications of the implementer will show the results in different levels. In this study, the research team has constructed a 3-level table of assessment. Summarized results of assessment are presented in the following table:

Table 4-22: Assessment of reliability of the methods applied in EIA

Method	Nature	Applicable condition	Capacity of implementer	Total cores	Reliability
Survey, sampling	2	2	2	6	High
Sampling and analysis of air quality	1	2	1	4	Very high
Sampling and analysis of water and soil quality	1	2	2	5	High
Socio-economic investigation	2	2	1	5	High
Impact matrix	3	2	1	6	High
Grid diagram	3	1	1	5	High
Rapid assessment	3	3	1	7	Pass
Conjecture	3	1	1	5	High

With each factor assessed using the 3-point scale:

- Nature of method: It is a quantitative, semi-quantitative and qualitative method, corresponding to the extents of 1, 2, 3.

- Applicable conditions: Satisfactory, high and very high, corresponding to the extents of 1, 2, 3.

- Qualifications of the implementer: Having been trained and certified in accordance with his/her specialty and very experienced in performing the similar studies - level 1; lack one of the two factors - level 2; lack the two factors - level 3.

Total points are divided into 3 levels of reliability: very high in 3-4 points; high reliability in 5-6 points and satisfactory in 7-9 points.

1. *Field survey and analysis of the current state of environmental quality.*

It is a highly visual method, reflecting current situation and the results mainly depend on the implementer's experience.

2. *Sampling and analysis of air quality in accordance the Vietnamese standards (Dust: TCVN 5067-1995; SO_2: TCVN 5971-1995; NO_2: TCVN 6137 -1995; Noise: TCVN: 5964-1995).*

   It is a proven and standardized method. Its results, however, contain random errors.

3. *Sampling and analysis of water quality in accordance with the standard procedures of Vietnam.*

   It is a proven and standardized method. Its results, however, contain random errors.

4. *Socio-economic survey through collection of data in the People's Committees of Wards*

Results of the method are highly dialogic, helping understanding of the past and exploration of the future. It is also subjective and much dependent on the experience of the implementer.

4.2.2. Assessment of applied methods and reliability of the assessments

Tools and methods used to assess the environmental impact of this project is currently popular to assess fully, accurately, objectively and scientifically the probable impacts in each stage and for each subject. The accuracy and reliability of this method is very highly.

- ***Establishment of impact matrices***

The correlation between the effects of each activity of the project and each environmental problem/environment component is shown on impact matrices, basing on which, the contents of detailed impact research are oriented.

The methodologies are commonly used to orient and determine insufficient data, simultaneously, allow making detailed plan on implementation. Results and effectiveness mainly depend on the whole research team's experience.

- ***Grid diagram***

It is a diagram of combined impacts and consequences in a certain interaction between the effected activities and environmental components, including the secondary and tertiary effects. It is shown in the method the effects with depth (time) and the simple interactions.

Research methodology is used to orient and determine the impacts' trend. It is very advantages in assessing the long-term consequences. It brings about qualitative results. Its results and effectiveness mainly depend on the experience of the research team.

- ***Rapid assessment***

The methods of rapid assessment were issued by the World Health Organization (WHO) in 1993. It is based on the nature of materials, technologies, and regularities of natural processes and experience to determine pollution levels.

It produces limited results in cases of limited figures, data relevant to professions.

In this study, much data on the load of pollutants (exhaust gases, solid waste sewage, etc.) are estimated basing on assumed power and technological characteristics. In the actual operation of the hospital, this is the most changeable data so it can be said that it is difficult to have 100% accurate quantitative data.

- ***Conjecture***

The rationale and experience will be based to infer the possible impacts thence consider the project's impacts on the quality of the environment and ecosystems in the region. It is a subjective method. Its results mainly depend on the awareness and qualifications of the researchers.

In addition to the above methods, in order to have data for realistic controls, we also refer to the data of environmental observation at the projects of the same scale and conditions.

To obtain accurate data during operation of the project, the Employer shall perform environmental monitoring program, basing on which, he will adjust and supplement the appropriate solutions to control pollution and limit the undesirable environmental impacts

4.2.3. Level of detail of assessments

Environmental impact assessment is performed in compliance with the following sequence:

- To determine and quantify sources of impacts basing on each activity/phase of the project causing impacts.
- To determine the spacious and time scale of the affected subjects.
- To assess impacts on the basis of the scale of impact sources, the spacious and time scale and the sensitivity of the affected subjects.

The assessments of the project's impacts are quite detailed and specific. And on the basis of the assessments, feasible measures to mitigate adverse impacts, prevent and response to environmental incidents are put forward to the project.

CHAPTER 5: MITIGATION MEASURES OF NEGATIVE IMPACTS, PREVENTION AND RESPONSE TO ENVIRONMENTAL RISKS AND INCIDENDS

To minimize environmental and social impacts, the project will access to following groups:

- *Avoidance*: Alternative analysis has been regarded as one of the most important mitigation measures to minimize potential adverse environmental and social impacts. Minimizing land acquisition and resettlement to the extent possible has also been a key criterion for alignment selection during the feasibility and EIA studies
- *Sound Engineering for design and construction*: The project has been designed and will be implemented with state-of-the art engineering
- *Comprehensive Mitigation plans*: The detailed environmental mitigation plan, Compensation and resettlement plan.

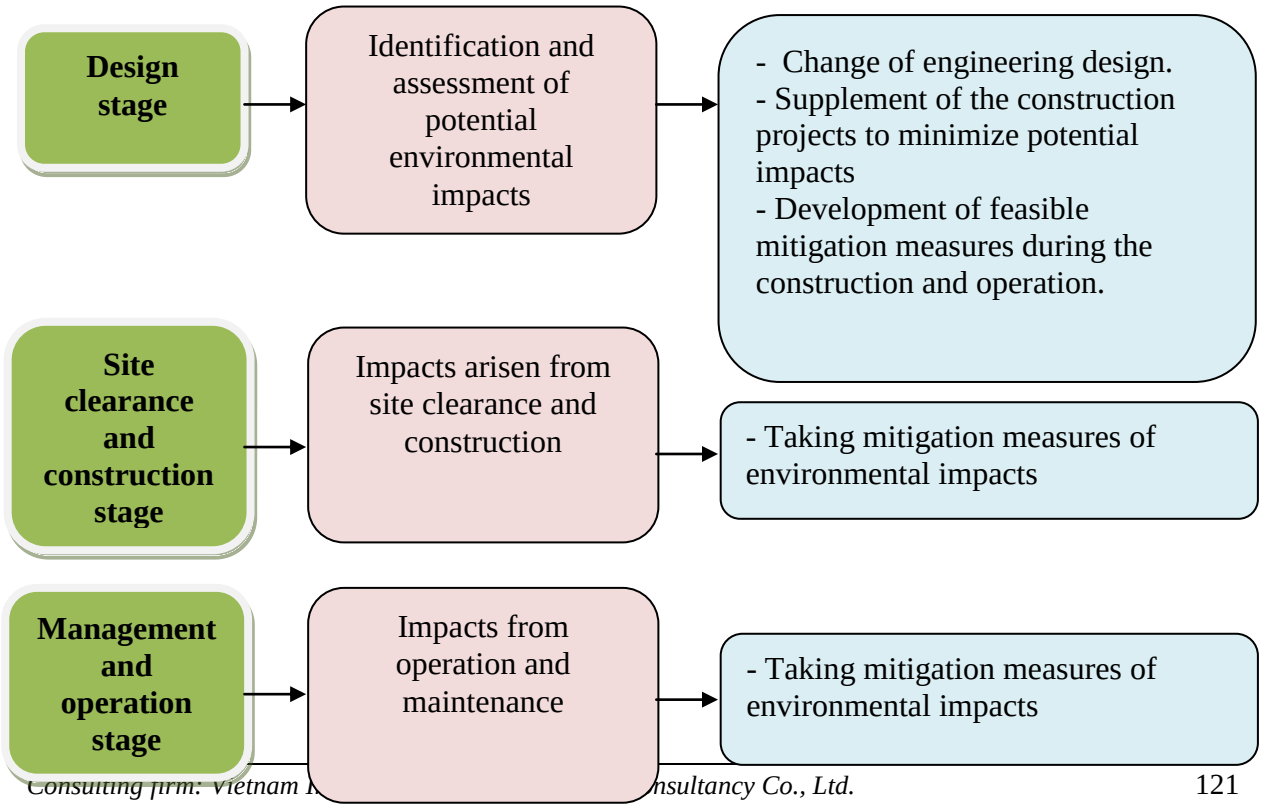
These measures will be integrated into the Construction Contractor's technical criteria of environment supervised by the environmental monitoring team as a part of the process of construction technical monitoring

5.1. General principles

- These mitigation measures may vary and depend on the project location, construction methods as well as the capacity of the participating parties. The mitigation measures including management" and "technical" plan will be taken by the stakeholders. Basically, the negative impacts can be minimized by:

+ The reasonable construction method that focuses on minimizing the environmental impacts. This type of construction works should be coordinated with the engineering designs of the entire project. A certain amount of the budget is required to pay for this.

+ Implementation of mitigation plans at the construction site. This plan should be prepared by the stakeholders and completed before the construction commencement.



5.2. Mitigation Measures of Environmental and Social Impacts

Mitigation measures of negative impacts during the project phases are divided into 2 basic parts: *(1) Typical mitigation measures – ECOPs - for all construction activities of the project and (2) site-specific impacts mitigation measures for the road and bridge project.*

(1) ECOPs: Environmental codes of practices for urban construction (ECOPs) outline typical impacts at low possibility in a range of construction activities of the urban development project. ECOPs also include mitigation measures for such impacts and a procedure to incorporate mitigation measures in construction contracts of the Contractor. During the detailed design of technical alternatives for each contract, the technical design consultant will incorporate specific parts of ECOPs in the contract and site-specific impact mitiagtion measures identified in the Environmental Management Plan (EMP).

(2) Site-specific impacts mitigation measures for each project location not mentioned in generic ECOPs or these impacts at a level in need of other mitigation measures beyond ECOPs will be described in EMP.

Actions to be taken to minimize negative impacts due to land acquisition and resettlement will be presented separately (in the Resettlement Plan), to be implemented and monitored separately.

5.2.1. Environmental Codes of Practices (ECOPs)

As a part of environmental assessment, an Environmental Management Plan (EMP) is a safeguards instrument that is typically used in many projects. EMP comprises information on and guidance for the process of mitigating and managing adverse environmental impacts throughout project implementation.

Environmental codes of practice (ECOPs) are mitigation measures for generic impacts from project activities during the construction phase and are intended to be included in the bidding documents as requirements directed to the construction contractor. ECOPs are not a formally recognized World Bank safeguards instrument but their use, as part of an EMP, is a convenient and effective way to ensure that generic and typical construction impacts are adequately mitigated during project implementation.

Main environmental and social impacts during the urban construction:

Construction activities for small works governed by these ECOPs are those whose impacts are of limited extent, temporary and reversible, and readily managed with good construction practices. The environmental and social issues covered in this document are:

- *Dust*
- *Air pollution*
- *Impacts from noise and vibration*
- *Water pollution*
- *Drainage and sedimentation control*
- *Management of stockpiles, quarries, and borrow pits*
- *Solid waste management*
- *Management of dredged materials*
- *Disruption of vegetative covers and ecological resources*
- *Traffic management*

- *Interruption of utility services*
- *Restoration of affected areas*
- *Worker and public safety*
- *Communication with local communities*
- *Chance findings*

Table 5-1: Mitigation measures from ECOPs

Environmental and social issues	Mitigation measures	Vietnam's regulations
1. Dust generation	• The Contractor is responsible for compliance with relevant Vietnamese legislation with respect to ambient air quality. • The Contractor shall ensure that the generation of dust is minimized and is not perceived as a nuisance by local residents and shall implement a dust control plan to maintain a safe working environment and minimize disturbances for surrounding residential areas/dwellings. • The Contractor shall implement dust suppression measures (e.g. use water spraying vehicles to water roads, covering of material stockpiles, etc.) as required. • Material loads shall be suitably covered and secured during transportation to prevent the scattering of soil, sand, materials, or dust. • Exposed soil and material stockpiles shall be protected against wind erosion and the location of stockpiles shall take into consideration the prevailing wind directions and locations of sensitive receptors.	• QCVN 05: 2013/BTNMT: National technical regulation on ambient air quality
2. Air pollution	• All vehicles must comply with Vietnamese regulations controlling allowable emission limits of exhaust gases. • Vehicles in Vietnam must undergo a regular emissions check and get certified named: "Certificate of conformity from inspection of quality, technical safety and environmental protection" following Decision No. 35/2005/QD-BGTVT; • There should be no burning of waste or construction materials (eg. Bitumen etc.) on site.	• TCVN 6438-2005: Road vehicles Maximum permitted emission limits of exhaust gas. • Decision No. 35/2005/QD-BGTVT on inspection of quality, technical safety and environmental protection; • QCVN 05:2013/BTNMT: National technical regulation on ambient air

Environmental and social issues	Mitigation measures	Vietnam's regulations
		quality
3. Impacts from noise and vibration	• The contractor is responsible for compliance with the relevant Vietnamese legislation with respect to noise and vibration. • All vehicles must have appropriate "Certificate of conformity from inspection of quality, technical safety and environmental protection" following Decision No. 35/2005/QD-BGTVT; to avoid exceeding noise emission from poorly maintained machines. • When needed, measures to reduce noise to acceptable levels must be implemented and could include silencers, mufflers, acoustically dampened panels or placement of noisy machines in acoustically protected areas.	• QCVN 26:2010/BTNMT: National technical regulation on noise • QCVN 27:2010/BTNMT: National technical regulation on vibration
4. Water pollution	• The Contractor must be responsible for compliance with the relevant Vietnamese legislation relevant to wastewater discharges into watercourses. • Portable or constructed toilets must be provided on site for construction workers. Wastewater from toilets as well as kitchens. Toilet wastewater: (i) must be treated through septic tank or (ii) use portable toilets and collect transfer out of the construction site. • Wastewater from kitchens, bathrooms, sinks must go through settling tank, through grease collecting material, then go into existing drainage system. • Wastewater over standards set by relevant Vietnam technical standards/regulations must be collected in a conservancy tank and removed from site by licensed waste collection units.  ***Patterns of portable toilet*** • Wastewater density over the Vietnam standard should be collected into tanks and transported by the functional agency.	• QCVN 09:2008/BTNMT: National Technical Standard on underground water Quality • QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater; • QCVN 24: 2009/BTNMT: National technical regulation on industrial wastewater; • TCVN 7222: 2002: General requirements on centralized wastewater treatment plant;.

Environmental and social issues	Mitigation measures	Vietnam's regulations
	• Before construction, all necessary wastewater disposal permits/licenses and/or wastewater disposal contract have been obtained • At completion of construction works, wastewater collection tanks and septic tanks shall be safely disposed or effectively sealed off. Portable toilets should be reused for other projects.	
5. Drainage and sedimentation control	• The Contractor shall follow the detailed drainage design included in the construction plans, intended to prevent storm water from causing local flooding or scouring slopes and areas of unprotected soil resulting in heavy sediment loads affecting local watercourses. • Ensure drainage system is always maintained cleared of mud and other obstructions. • Areas not disturbed by construction activities shall be maintained in their existing conditions. • Earthworks, and filling of pits shall be properly maintained, in accordance with the construction specifications, including measures such as installation of drains, use of plant coverage. • To avoid sediment-laded runoff that could adversely impact watercourses, install sediment control structures where needed to slow or redirect runoff and trap sediment until vegetation is established. • The amount of excavated soil will be stored along the route at the locations agreed upon with the local authorities and people. At the same time, the contractor will not have construction plans, earthworks in the rainy season to avoid leaching, water pollution. In the case of construction during the rainy season, the contractors should have appropriate construction methods to prevent local flooding as embankment, shielding excavated land by canvas, digging temporary drainage ditches and pumping for drying the construction site and limit flooding.	• TCVN 4447:1987: Earth works-Codes for construction • Circular No. 22/2010/TT-BXD dated 03 Dec. 2010 on regulation of construction safety • QCVN 08:2008/BTNMT – National technical regulation on quality of surface water
6. Management of stockpiles, quarries, and borrow pits	• All locations to be used must be previously identified in the approved construction specifications. Sensitive sites such as scenic spots, areas of natural habitat, areas near sensitive receptors, or areas near water should be avoided. • An open ditch shall be built around the stockpile site to intercept wastewater. • Stockpile topsoil when first opening a borrow pit and use	

Environmental and social issues	Mitigation measures	Vietnam's regulations
	it later to restore the area to near natural conditions. • If needed, disposal sites shall include a retaining wall. • If the need for new sites arises during construction, they must be pre-approved by the Construction Engineer. • If landowners are affected by use of their areas for stockpiles or borrow pits, they must be included in the project resettlement plan. • If access roads are needed, they must have been considered in the environmental assessment.	
7. Solid waste	• Before construction, a solid waste control procedure (storage, provision of bins, site clean-up schedule, bin clean-out schedule, etc.) must be prepared by Contractors and it must be carefully followed during construction activities. • Before construction, all necessary waste disposal permits or licenses must be obtained. • Measures shall be taken to reduce the potential for litter and negligent behavior with regard to the disposal of all refuse. At all places of work, the Contractor shall provide litter bins, containers and refuse collection facilities. • Solid waste may be temporarily stored on site in a designated area approved by the Construction Supervision Consultant and relevant local authorities prior to collection and disposal through a licensed waste collector, for example, URENCO. • Waste storage containers shall be covered, tip-proof, weatherproof and scavenger proof.  • No burning, on-site burying or dumping of solid waste shall occur. • Recyclable materials such as wooden plates for trench works, steel, scaffolding material, site holding, packaging material, etc shall be collected and separated on-site from	• Decree No. 59/2007/ND-CP on solid waste management • Decree No. 38/2015/ND-CP dated 24 April 2015 of the Government on management of waste and scraps.

Environmental and social issues	Mitigation measures	Vietnam's regulations
	other waste sources for reuse, for use as fill, or for sale. • If not removed off site, solid waste or construction debris shall be disposed of only at sites identified and approved by the Construction Supervision Consultant and included in the solid waste plan. Under no circumstances shall the contractor dispose of any material in environmentally sensitive areas, such as in areas of natural habitat or in watercourses.	
8. Chemical or hazardous wastes	• Chemical waste of any kind shall be disposed of at an approved appropriate landfill site and in accordance with local legislative requirements. The Contractor shall obtain needed disposal certificates. • The removal of asbestos-containing materials or other toxic substances shall be performed and disposed of by specially trained and certified workers. • Used oil and grease shall be removed from site and sold to an approved used oil recycling company. • Used oil, lubricants, cleaning materials, etc. from the maintenance of vehicles and machinery shall be collected in holding tanks and removed from site by a specialized oil recycling company for disposal at an approved hazardous waste site. • Used oil or oil-contaminated materials that could potentially contain PCBs shall be securely stored to avoid any leakage or affecting workers. The Danang DONRE must be contacted for further guidance. • Unused or rejected tar or bituminous products shall be returned to the supplier's production plant. • During construction of bridges and culverts, waste welding will be collected as hazardous waste and must be sold / collected by functional units handling hazardous waste. • Relevant agencies shall be promptly informed of any accidental spill or incident. • Store chemicals appropriately and with appropriate labeling • Appropriate communication and training programs should be put in place to prepare workers to recognize and respond to workplace chemical hazards • Prepare and initiate a remedial action following any spill or incident. In this case, the contractor shall provide a	• Decision No. 23/2006/QD-BTNMT with list of hazardous substance • Circular No. 12/2011/TT-BTNMT dated 14 April 2011 on management of hazardous substance

Environmental and social issues	Mitigation measures	Vietnam's regulations
	report explaining the reasons for the spill or incident, remedial action taken, consequences/damage from the spill, and proposed corrective actions.	
9. Management of sludge	• Dredging plan should be established including time schedule, method statement to meet the requirements of traffic safety, public health, and environmental sanitation. In order to ensure dredging that is consistent with environmental regulations, key decision makers (local authority, DONRE, utility company, Construction Supervision Consultant, etc.) must be involved and concur in each key decision point in the process leading to preparation and implementation of a plan. • Characteristics of sludge/sediment should be determined by sampling and analysis if not already fully evaluated during the EIA. Sludge that is heavily contaminated would require measures that go beyond the scope of these ECOPs. • Ensure that dredged material management plans incorporate environmental considerations in the identification of short-term and long-term disposal alternatives, consider methods to reduce dredging, and maximize the beneficial use of dredged materials. • The dredging should be implemented before water level rises. • Lixiviate from dredged materials should not be allowed to enter watercourses without appropriate filtering or treatment. • Collected dredged materials have to be processed, as per Vietnamese regulations on waste collection, to ensure safe and environmentally secure transportation, storage, treatment and management • Agencies involved in handling of sludge should be specialized and have certification of sludge handling. Guidelines for certification of sludge handling according to the Circular No. 12/2011/TT-BTNMT on management of hazardous substance. • Sanitary landfill site should meet technical requirements, based on level of potential contamination.	• Decision No. 23/2006/QD-BTNMT with list of hazardous substance • Decree No. 59/2007/ND-CP dated 09 April 2007 on solid waste management • Decree No. 38/2015/ND-CP dated 24 April 2015 on management of waste and scrabs.
10. Disruption of vegetative cover and	• The Contractor shall prepare a Clearance, Revegetation and Restoration Management Plan for prior approval by the Construction Engineer, following relevant regulations. The	• Law on Environment protection No.

Environmental and social issues	Mitigation measures	Vietnam's regulations
ecological resources	Clearance Plan shall be approved by Construction Supervision Consultant and followed strictly by contractor. Areas to be cleared should be minimized as much as possible. • The Contractor shall remove topsoil from all areas where topsoil will be impacted on by rehabilitation activities, including temporary activities such as storage and stockpiling, etc; the stripped topsoil shall be stockpiled in areas agreed with the Construction Supervision Consultant for later use in re-vegetation and shall be adequately protected. • The application of chemicals for vegetation clearing is not permitted. • Prohibit cutting of any tree unless explicitly authorized in the vegetation clearing plan. • When needed, erect temporary protective fencing to efficiently protect the preserved trees before commencement of any works within the site. • Area of potential importance as an ecological resource should not be disturbed. This could include areas of breeding or feeding of birds or animals, fish spawning areas, or any area that is protected as a green space. • The Contractor shall ensure that no hunting, trapping shooting, poisoning of fauna takes place.	55/2014/QH13
11. Traffic management	• Before construction, carry out consultations with local government and community and with traffic police. • Significant increases in number of vehicle trips must be covered in a construction plan previously approved. Routing, especially of heavy vehicles, needs to take into account sensitive sites such as schools, hospitals, and markets. • Installation of lighting at night must be done if this is necessary to ensure safe traffic circulation. • Place signs around the construction areas to facilitate traffic movement, provide directions to various components of the works, and provide safety advice and warning. • Using safe traffic control measures, including road/rivers/canal signs and flag persons to warn of dangerous conditions. • Avoid material transportation for construction during rush hour.	• Law on traffic and transportation No. 23/2008/QH12 • Law on construction No.16/2003/QH11 • Circular No.22/2010/TT-BXD dated 03 Dec., 2010 on labor safety during the construction of civil works.

Environmental and social issues	Mitigation measures	Vietnam's regulations
	• Passageways for pedestrians and vehicles within and outside construction areas should be segregated and provide for easy, safe, and appropriate access. Signpost shall be installed appropriately in both water-ways and roads where necessary.	
12. Interruption of utility services	• Planned and unplanned interruptions to water, gas, power, internet services: the Contractor must undertake prior consultation and contingency planning with local authorities about the consequences of a particular service failure or disconnection. • Coordinate with relevant utility providers to establish appropriate construction schedules. • Provide information to affected households on working schedules as well as planned disruptions (at least 5 days in advance). • Interruptions of water supply to agricultural areas must also be avoided. • The contractor should ensure alternative water supply to affected residents in the event of disruptions lasting more than one day. • Any damages to existing utility systems of cable shall be reported to authorities and repaired as soon as possible.	• Decree No. 73/2010/ND-CP on administrative penalization security and society issues
13. Restoration of affected areas	• Cleared areas such as borrow pits which are no longer in use, disposal areas, site facilities, workers' camps, stockpiles areas, working platforms and any areas temporarily occupied during construction of the project works shall be restored using landscaping, adequate drainage and revegetation. • Start revegetation as soon as possible. Appropriate local native species of vegetation shall be selected for the planting and restoration of the natural landforms. • Spoil heaps and excavated slopes shall be re-profiled to stable batters, and grassed to prevent erosion; • All affected areas shall be landscaped and any necessary remedial works shall be undertaken without delay, including green-spacing, roads, bridges and other existing works • Trees shall be planted at exposed land and on slopes to prevent or reduce land collapse and keep stability of slopes • Soil contaminated with chemicals or hazardous substances shall be removed and transported and buried in	• Law on Environment protection No. 55/2014/QH13

Environmental and social issues	Mitigation measures	Vietnam's regulations
	waste disposal areas. • Restore all damaged road and bridges caused by project activities.	
14. Worker and public Safety	• Contractor shall comply with all Vietnamese regulations regarding worker safety. • Prepare and implement action plan to cope with risk and emergency • Preparation of emergency aid service at construction site • Training workers on occupational safety regulations • Ensure that ear pieces are provided to and used by workers who must use noisy machines such as piling, explosion, mixing, etc., for noise control and workers protection. • During demolition of existing infrastructure, workers and the general public must be protected from falling debris by measures such as chutes, traffic control, and use of restricted access zones. • Install fences, barriers, dangerous warning/prohibition site around the construction area which showing potential danger to public people • The contractor shall provide safety measures as installation of fences, barriers warning signs, lighting system against traffic accidents as well as other risk to people and sensitive areas. • If previous assessments indicate there could be unexploded ordnance (UXO), clearance must be done by qualified personnel and as per detailed plans approved by the Construction Engineer.	• Circular No. 22/2010/TT-BXD dated 03 December 2010 on regulation of construction safety • Directive No. 02 /2008/CT-BXD on safety and sanitation issues in construction agencies • TCVN 5308-91: Technical regulation on safety in construction • Decision No. 96/2006/QD-TTg dated 04 May 2006 on management and implementation of bomb mine explosive material disposal.
15. Communication with local communities	• Maintain open communications with the local government and concerned communities; the contractor shall coordinate with local authorities (leaders of local wards or communes, leader of villages) for agreed schedules of construction activities at areas nearby sensitive places or at sensitive times (e.g., religious festival days). • Copies in Vietnamese of these ECOPs and of other relevant environmental safeguard documents shall be made available to local communities and to workers at the site.	• Decree No. 73/2010/ND-CP on administrative penalization security and society issues

Environmental and social issues	Mitigation measures	Vietnam's regulations
	• Reduced playground space, loss of playing fields and car parking: The loss of amenities during the construction process is often an unavoidable source of inconvenience to users in sensitive areas. However, early consultation with those affected, provides the opportunity to investigate and implement alternatives. • Disseminate project information to affected parties (for example local authority, enterprises and affected households, etc) through community meetings before construction commencement; • Provide a community contact channel from whom interested parties can receive information on site activities, project status and project implementation results; • Provide all information, especially technical findings, in a language that is understandable to the general public and in a form of useful to interested citizens and elected officials through the preparation of fact sheets and news release, when major findings become available during project phase; • Monitor concerns and requirements of community; • Respond to inquiries by telephone and in writing in a timely and accurate manner; • Inform local residents about construction and work schedules, interruption of services, traffic detour routes and provisional bus routes, blasting and demolition, as appropriate; • Provide technical documents and drawings to community, especially a sketch of the construction area and the EMP of the construction site; • Notification boards shall be erected at all construction sites providing information about the project, as well as contact information about the site managers, environmental staff, health and safety staff, telephone numbers and other contact information so that any affected people can have the channel to voice their concerns and suggestions.	
16. Chance find procedures	If the Contractor discovers archeological sites, historical sites, remains and objects, including graveyards and/or individual graves during excavation or construction, the Contractor shall: • Stop the construction activities in the area of the chance find;	• Law on Cultural Heritage 32/2009/QH12 • Law on amending and supplementing a

Environmental and social issues	Mitigation measures	Vietnam's regulations
	• Delineate the discovered site or area; • Secure the sites to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities or the Department of Culture, Sports and Tourism takes over; • Notify the Construction Supervision Consultant who in turn will notify responsible local or national authorities in charge of the Cultural Property of Viet Nam (within 24 hours or less); • Relevant local or national authorities would be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values; • Decisions on how to handle the finding shall be taken by the responsible authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance) conservation, preservation, restoration and acquisition; • If the cultural sites and/or relics are of high value and site preservation is recommended by the professionals and required by the cultural relics authority, the Project's Owner will need to make necessary design changes to accommodate the request and preserve the site; • Decisions concerning the management of the finding shall be communicated in writing by relevant authorities; • Construction works could resume only after permission is granted from the responsible local authorities concerning protection of the heritage.	number of articles of Law on Cultural Heritage 28/2001/QH10 • Decree No. 98/2010/ND-CP dated 21/09/2010 of the Government on implementing a number of articles of Law on cultural heritage and Law on amendment and supplementation of a number of articles of Law on cultural heritage.

5.2.2. Typical mitigation measures

The following sections will present site-specific impacts and mitigation measures not presented fully in the application of Environmental codes of practice (ECOPs). This is because the impacts are not typical and not included in ECOPs (the severity of impacts is beyond the mitigation measures range in ECOPs or the nature of mitigation measures required is too specific).

(a) Design measures

The project design must comply with the following requirements:

- The environmental components and related issues must be integrated in the design and plan of the project. The detailed designs should minimize adverse impacts on the environment by maximizing the reuse of existing conditions and properly selecting location for new construction works so that disturbances to the environment, people and project works are smallest. Under the terms of Vietnam's construction standards (environmental and natural resources protection), the construction projects should:

i) Not cause adverse impacts on the environment, and technical regulations on protecting the environment and landscape should be monitored.

ii) Protect natural protected areas and historical, cultural and religious structures.

iii) Ensure rational and sustainable use of natural resources.

iv) Respect traditional customs, practices and religion of local people.

During the road designing, it is required to avoid potential disturbance to the suitable existing infrastructure. All technical issues must be studied with the participation of stakeholders and incorporated into the final design.

Construction and maintenance conditions should be made in a reasonable manner. Transportation of construction materials and excavated soil disposal, as well as access roads and backfilled pits need to be studied carefully and designed reasonably. To minimize transport requirements and the impacts outside the construction area, maximum use of the excavation materials in the construction area and near the construction area is necessary and recommended.

Specially, for the Road DH2, it is required to be calculated, designed with suitable ground level and structures to adapt to climate change impacts under scenarios that MONRE forecasted, especially in cases where heavy rains occur and prolong, combined with high tides and sea level rise causing flooding.

Also, the construction contractor should develop a reasonable construction plan, organize well the drainage in the construction works, especially during the rainy season to avoid local flooding.

On the other hand, for junctions with roads (National highway 14B, Hoang Van Thai road, provincial road DT602 and DT604), the Client and Consulting unit should design reasonably to ensure synchronized traffic and prevent the risk of traffic accidents that might occur.

Especially, to minimize flood risks caused by the construction of road, the Client and Consulting Firm designed vertical and horizontal drainage culverts.

- *Vertical drainage:*

Vertical drainage is arranged on the sidewalk, the center of the drainage system is 2.5m from the road surface edge. Centrifugal concrete pipes D = 800 are used, putting on crushed course stone 4x6 with thickness of 30cm; Manholes, inlets and horizontal raceways arranged at intervals of 25m, concrete structures M150 with M200 reinforced concrete cover. At the horizontal locations, arrange centrifuge bearing pipe.

Vertical drainage is connected to bridges, outlets to Tuy Loan river.

At the segments invested in different stages, ditches along the excavated base are reinforced by concrete pieces with dimensions (57x50x8) cm.

- *Horizontal drainage:*

The drains on the road are designed to use box culverts with aperture from 100x100 cm to 300x300 cm.

- Culvert body: Reinforced concrete M300 stone 1x2, culvert body cutoff is made by concrete M200 stone 1x2.

- Upstream, downstream: Head wall, side wall with reinforced concrete M300 stone 1x2, cutoff culvert ground by concrete M150 stone 2x4 on padding layer thickness of 10cm. Reinforcement against erosion for the upstream and downstream by rip rap.

- Load reduction slabs: by reinforced concrete M200 stone 1x2, manholes of the vertical drainage by concrete M150 with reinforced concrete M200 slab cover.

+ Box culvert (100x100) cm : 13/606.5 (piece/meter long);

+ Box culvert (150x150) cm : 6/144 (piece/meter long);

+ Box culvert 2x(150x150) cm : 1/22 (piece/meter long);

+ Box culvert (200x200) cm : 2/62 (piece/meter long);

+ Box culvert 2x(300x200) cm : 1/23 (piece/meter long);

+ Box culvert (300x300) cm : 5/118 (piece/meter long).

Quantity and specific positions of each culvert are shown in Tables 1.6 and 1.7.

With the huge number and appropriate size of drainage culverts and ditches, the drainage will be ensured, thereby minimizing flooding in case of heavy rains.

For temporary drainage/ temporary flood prevention during the construction phase:

- Establishment vertical and horizontal drainage after filling soil leveling
- Digging drainage canal according to the current state of roads
- Arrangement of available pumps and other equipments to serve drainage
- After receiving the notice, the response from the local community, it is necessary to implement measures to clear the flow, drainage enhanced pump.

(b) Mitigation measures before construction phase

Minimizing the impacts of land acquisition and resettlement:

- Implementation of the resettlement plan (RP) follows the relevant provisions:

- The first activity to minimize the project impacts is to help the households understand the location and benefits of the project as well as the anticipated impacts to minimize the impacts all together. Many community consultations were conducted in the project area to disclose (i) information of the project and (ii) the expected impacts as well as measures of compensation for land acquisition and resettlement. During the consultations, many ideas were exchanged. In general, the people are very supportive of the project and hoped the project could be implemented to address the local

flooding.

- To reduce to the minimum the impact of land acquisition, the project has been studied and designed with several different options, then assessed and selection of the optimal plan to prevent and minimize the loss of land, homes, trees, buildings, infrastructure has been made following the socio-economic development plan of the localities where the roads pass through. In the event negative impacts on assets are inevitable, there will be fair compensation and the compensation value guaranteed at least to make up for the damage, in accordance with criteria set out in the OP4.12 of the World Bank and compensation and support policies on resettlement of the Vietnam Government.
- All the objects affected by the project will be compensated and/or supported under the Resettlement Policy Framework of Danang city approved by the Government of Vietnam (April 2012) and the World Bank. A resettlement report was prepared frp the project and will be submitted for World Bank's approval. The affected households will be compensated for the affected assets at replacement cost and other assistance if necessary to achieve the objectives of this policy in the case these households own land in the project area before the cutoff date.
- In some cases where the households stay nearby the roads to be improved, temporary impacts during construction are inevitable. Fair compensation with the compensation value guaranteed at least to make up for the damage was mentioned in the RP in accordance with the project policy.
- During the construction of works, there will be negative impacts on people in the area such as affecting trade and business activities or travel of the people. Therefore, a number of measures to mitigate the impacts in the construction will be applied such as successive construction method, finished construction of each segment and prior notice to the affected households, arrangement temporary roads for people and businessman. According to the resettlement policy of the project, all public buildings affected will be rebuilt or repaired and restored.
- The Client and design consulting unit have identified the location of civil works, public works and design measures to avoid/minimize impacts... At the same time, criteria for minimizing the impacts during construction have been established such as labor safety plan (when construction is near residential areas), arrangement of suitable tools (signage, baffle with residential areas...) and working time... to minimize temporary impacts...

Minimizing impacts on safety and electricity supply suspension due to relocation of electric poles

- Prepare plans for dismantling and notify the people, production facilities around the area of the dismantling time and electricity supply suspension.
- Contractors, Project Management Unit coordinate with the relevant authorities Da Nang EVN, Department of Da Nang Construction) in the dismantling, proper use of specialized workers for the dismantling to avoid risks.

(c) Mitigation of impacts during the construction of Road DH2:

- Site clearance includes cleaning trees and vegetable cover beyond right of way of the construction site.

- Large amount of land required to fill up the roadbed, taken from uncontrolled materials mines.
- Blocked natural flows
- Danger in the construction site for residential areas and other areas outside the construction site.
- Vibration from machinery causes damage to adjacent houses.
- Concrete and asphalt mixing plants (if being built at the site) will generate exhaust gas and wastewater, leading to pollution.

→ Mitigation measures:

- Clear the area before construction by bomb demining professionals and they are licensed.

- Ensure that contractors prepare and implement a specific/ particular environmental management plan (as required by the contract) for every aspect of the job - site clearance, land acquisition, temporary and permanent drainage system and pavement works, transport and regional security. In particular, and in addition to the general requirements are specified in the following ECOPs

- Ensure not cut trees outside the right of way.
- Ensure that from starting the construction, the drainage is prioritized. Drainage system consists of drains, sand traps and flow reduction structure, etc.
- Ensure that material mines to be exploited, operated, closed and restored in manner for excavation positions in the project works and included in requirements of the contracts and the Environmental Management Plan (EMP).
- Ensure that the road base is built systematically to avoid repeated transportation and stable construction surface right after completion.
- Ensure that protection measures to be determined in the contract, including natural methods such as planting grass, shrubs and artificial measures such as stone paving, concreting, reinforced fiber or geo-textile fabric suitably with the conditions in the construction site when the construction process is on-going or completed.
- Ensure temporary box culverts to be installed for any natural flow that works passes over.
- Ensure that equipment of repairing machines and warehouses of materials and machines, such as material processing factory located in the positions far from canals, ditches, rivers, streams, residential areas and other sensitive areas.
- Ensure that all drivers and operators of machines must be qualified and have certification of practices and trained and comply with the traffic management plan.
- Ensure that machines such as concrete and asphalt mixing plant to be equipped with dust collection system, to be operated and maintained according to standards and connected with canals, ditches to sediment and waste collection holes, traps for preliminary wastewater treatment.
- Gathering machinery, materials, mixing must put away from the location, sensitive projects such as schools, churches, temples on the route. Construction activities must be calculated so as not to affect the festivals, religious activities.
- For the section through the area of low hills, the risk of local landslides at some points may occur, however the risks will be overcome in the process of the survey of design

/ construction consultant unit. The area will be changed alignment or sure ground reinforcement, considering the case of the embankment if needed.

(d) Mitigate impacts during DH2 road operation phase:

After completion of construction, the different traffic vehicles will operate on the road. The main short-term effects include increased traffic accidents and pedestrian because the vehicle speed is higher than allowed road standards; premature degradation of the road and embankment slopes, drainage works due to the lack of maintenance.

To mitigate the impacts mentioned above, the following measures will be taken by city road maintenance agencies:

- Ensure that road safety is provided, including signs, light ... has been permanently installed in the process of construction and effective maintenance and renewed as necessary.
- Ensure operational plans and city maintenance, and related budget, including the work and the resources needed for road maintenance as the completed state;
- Ensure with the aid of traffic control authorities, the vehicles have exceeded the stipulated tonnage will not be circulated on the road.

CHAPTER 6: ENVIRONMENTAL MANAGEMENT PLAN

6.1. Summary of mitigation measures of negative impacts

*** Design phase:**

The project design must comply with the following requirements:

- The environmental elements and related issues must be integrated in the design and planning of the project. The detailed designs should minimize the negative environmental impacts through maximum reuse of available conditions and selecting location of new works in the areas so that the disturbance to environment, people and works is minimal. According to Vietnam construction standards (environmental and natural resources protection), the construction projects must:

i) Not cause negative environmental impacts and technical regulations on environmental and landscape protection should be monitored.

ii) Protect the natural protected areas and historical, cultural and religious heritages.

iii) Ensure the appropriate and sustainable use of natural resources.

iv) Respect the traditional customs and religion of the local people.

In designing the road, it is required to avoid the potential for disturbance to the existing infrastructures. All technical issues have been studied with the participation of the stakeholders, and then incorporated into the final design.

The conditions for construction and maintenance should be given in a reasonable manner. The transport of construction materials and disposal of excavated soil as well as the path and the landfill cells should be studied carefully and properly designed. To minimize the transportation requirements and impacts outside the construction site, the maximum use of excavated materials at the construction site and near the construction area is necessary and encouraged.

*** Construction phase:**

During the construction phase, all the construction works of the subproject will be undertaken in accordance with appropriate standards, technical specifications and bidding documents/contracts. The preparation of bidding documents/contracts as well as the terms of reference for construction supervision consultants will be considered and issued with "No-objection letter" by the World Bank. The environmental mitigation measures will be presented in the next section. The technical regulations for specific activities such as the operation of the mining quarries, the material batching plant and rearrangement of the processing factories and production enterprises will be presented in separate sections of this chapter.

*** Operation phase:**

During the operation phase, the project owner and the management and operation units should periodically monitor and supervise the project performance indicators and monitor the compliance with the environmental protection measures which have been approved in the EIA report of the project. In addition, the environmental monitoring organization for the entire project will be presented in the following section:

6.1.1. Mitigation Measures of Environmental Impacts

Mitigation measures of negative impacts during the project phases are divided into 2 basic parts: *(1) Typical mitigation measures – ECOPs - for all construction activities of the project and (2) site-specific impact mitigation measures for every project location.*

(1) ECOPs: Environmental codes of practices for urban construction outline typical impacts at low possibility in a range of construction activities of the project. ECOPs also include mitigation measures for such impacts and a procedure to incorporate mitigation measures in construction contracts of the Contractor. During the detailed design of technical alternatives for each contract, the technical design consultant will incorporate specific parts of ECOPs in the contract and site-specific impacts measures identified in the Environmental Management Plan (EMP).

(2) Site-specific impacts mitigation measures for each project location not mentioned in generic ECOPs or these impacts at a level in need of other mitigation measures beyond ECOPs will be described in EMP.

Actions to be taken to minimize negative impacts due to land acquisition and resettlement will be presented separately (in the Resettlement Plan), to be implemented and monitored separately.

1) Environmental Codes of Practices (ECOPs)

As a part of environmental assessment, an Environmental Management Plan (EMP) is a safeguards instrument that is typically used in many projects. EMP comprises information on and guidance for the process of mitigating and managing adverse environmental impacts throughout project implementation.

Environmental codes of practice (ECOPs) are mitigation measures for generic impacts from project activities during the construction phase and are intended to be included in the bidding documents as requirements directed to the construction contractor. ECOPs are not a formally recognized World Bank safeguards instrument but their use, as part of an EMP, is a convenient and effective way to ensure that generic and typical construction impacts are adequately mitigated during project implementation

Main environmental and social impacts during the construction of urban works:

Construction activities for small works governed by these ECOPs are those whose impacts are of limited extent, temporary and reversible, and readily managed with good construction practices. The environmental and social issues covered in this document are:

- *Dust*
- *Air pollution*
- *Impacts from noise and vibration*
- *Water pollution*
- *Drainage and sedimentation control*
- *Management of stockpiles, quarries, and borrow pits*
- *Solid waste management*
- *Management of dredged materials*
- *Disruption of vegetative covers and ecological resources*
- *Traffic management*
- *Interruption of utility services*
- *Restoration of affected areas*
- *Worker and public safety*

- *Communication with local communities*
- *Chance findings*

Table 6-1: Environmental Codes of Practices for urban works (ECOPs)

Environmental and social issues	Mitigation measures	Vietnam's regulations
17. Dust generation	• The Contractor is responsible for compliance with relevant Vietnamese legislation with respect to ambient air quality. • The Contractor shall ensure that the generation of dust is minimized and is not perceived as a nuisance by local residents and shall implement a dust control plan to maintain a safe working environment and minimize disturbances for surrounding residential areas/dwellings. • The Contractor shall implement dust suppression measures (e.g. use water spraying vehicles to water roads, covering of material stockpiles, etc.) as required. • Material loads shall be suitably covered and secured during transportation to prevent the scattering of soil, sand, materials, or dust. • Exposed soil and material stockpiles shall be protected against wind erosion and the location of stockpiles shall take into consideration the prevailing wind directions and locations of sensitive receptors.	• QCVN 05: 2013/BTNMT: National technical regulation on ambient air quality
18. Air pollution	• All vehicles must comply with Vietnamese regulations controlling allowable emission limits of exhaust gases. • Vehicles in Vietnam must undergo a regular emissions check and get certified named: "Certificate of conformity from inspection of quality, technical safety and environmental protection" following Decision No. 35/2005/QD-BGTVT; • There should be no burning of waste or construction materials (eg. Bitumen etc.) on site.	• TCVN 6438-2005: Road vehicles Maximum permitted emission limits of exhaust gas. • Decision No. 35/2005/QD-BGTVT on inspection of quality, technical safety and environmental protection; • QCVN 05:2013/BTNMT: National technical regulation on ambient air quality

Environmental and social issues	Mitigation measures	Vietnam's regulations
19. Impacts from noise and vibration	• The contractor is responsible for compliance with the relevant Vietnamese legislation with respect to noise and vibration. • All vehicles must have appropriate "Certificate of conformity from inspection of quality, technical safety and environmental protection" following Decision No. 35/2005/QD-BGTVT; to avoid exceeding noise emission from poorly maintained machines. • When needed, measures to reduce noise to acceptable levels must be implemented and could include silencers, mufflers, acoustically dampened panels or placement of noisy machines in acoustically protected areas.	• QCVN 26:2010/BTNMT: National technical regulation on noise • QCVN 27:2010/BTNMT: National technical regulation on vibration
20. Water pollution	• The Contractor must be responsible for compliance with the relevant Vietnamese legislation relevant to wastewater discharges into watercourses. • Portable or constructed toilets must be provided on site for construction workers. Wastewater from toilets as well as kitchens, showers, sinks, etc. shall be discharged into a conservancy tank for removal from the site or discharged into municipal sewerage systems; there should be no direct discharges to any domestic waterbody. • Wastewater over standards set by relevant Vietnam technical standards/regulations must be collected in a conservancy tank and removed from site by licensed waste collection units.  ***Patterns of portable toilet*** • Wastewater density over the Vietnam standard should be collected into tanks and transported by the functional agency. • Before construction, all necessary wastewater disposal permits/licenses and/or wastewater disposal contract have been obtained • At completion of construction works, wastewater collection tanks and septic tanks shall be safely disposed or effectively sealed off. Portable toilets should be reused for other projects.	• QCVN 09:2008/BTNMT: National Technical Standard on underground water Quality • QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater; • QCVN 24: 2009/BTNMT: National technical regulation on industrial wastewater; • TCVN 7222: 2002: General requirements on centralized wastewater treatment plant;.

Environmental and social issues	Mitigation measures	Vietnam's regulations
21. Drainage and sedimentation control	• The Contractor shall follow the detailed drainage design included in the construction plans, intended to prevent storm water from causing local flooding or scouring slopes and areas of unprotected soil resulting in heavy sediment loads affecting local watercourses. • Ensure drainage system is always maintained cleared of mud and other obstructions. • Areas not disturbed by construction activities shall be maintained in their existing conditions. • Earthworks, and filling of pits shall be properly maintained, in accordance with the construction specifications, including measures such as installation of drains, use of plant coverage. • To avoid sediment-laded runoff that could adversely impact watercourses, install sediment control structures where needed to slow or redirect runoff and trap sediment until vegetation is established. • The amount of excavated soil will be stored along the route at the locations agreed upon with the local authorities and people. At the same time, the contractor will not have construction plans, earthworks in the rainy season to avoid leaching, water pollution. In the case of construction during the rainy season, the contractors should have appropriate construction methods to prevent local flooding as embankment, shielding excavated land by canvas, digging temporary drainage ditches and pumping for drying the construction site and limit flooding.	• TCVN 4447:1987: Earth works-Codes for construction • Circular No. 22/2010/TT-BXD dated 03 Dec. 2010 on regulation of construction safety • QCVN 08:2008/BTNMT – National technical regulation on quality of surface water
22. Management of stockpiles, quarries, and borrow pits	• All locations to be used must be previously identified in the approved construction specifications. Sensitive sites such as scenic spots, areas of natural habitat, areas near sensitive receptors, or areas near water should be avoided. • An open ditch shall be built around the stockpile site to intercept wastewater. • Stockpile topsoil when first opening a borrow pit and use it later to restore the area to near natural conditions. • If needed, disposal sites shall include a retaining wall. • If the need for new sites arises during construction, they must be pre-approved by the Construction Engineer. • If landowners are affected by use of their areas for stockpiles or borrow pits, they must be included in the project resettlement plan.	

Environmental and social issues	Mitigation measures	Vietnam's regulations
	• If access roads are needed, they must have been considered in the environmental assessment.	
23. Solid waste	• Before construction, a solid waste control procedure (storage, provision of bins, site clean-up schedule, bin clean-out schedule, etc.) must be prepared by Contractors and it must be carefully followed during construction activities. • Before construction, all necessary waste disposal permits or licenses must be obtained. • Measures shall be taken to reduce the potential for litter and negligent behavior with regard to the disposal of all refuse. At all places of work, the Contractor shall provide litter bins, containers and refuse collection facilities. • Solid waste may be temporarily stored on site in a designated area approved by the Construction Supervision Consultant and relevant local authorities prior to collection and disposal through a licensed waste collector, for example, URENCO. • Waste storage containers shall be covered, tip-proof, weatherproof and scavenger proof.  • No burning, on-site burying or dumping of solid waste shall occur. • Recyclable materials such as wooden plates for trench works, steel, scaffolding material, site holding, packaging material, etc shall be collected and separated on-site from other waste sources for reuse, for use as fill, or for sale. • If not removed off site, solid waste or construction debris shall be disposed of only at sites identified and approved by the Construction Supervision Consultant and included in the solid waste plan. Under no circumstances shall the contractor dispose of any material in environmentally sensitive areas, such as in areas of natural habitat or in watercourses.	• Decree No. 59/2007/ND-CP on solid waste management • Decree No. 38/2015/ND-CP dated 24 April 2015 of the Government on management of waste and scraps.

Environmental and social issues	Mitigation measures	Vietnam's regulations
24. Chemical or hazardous wastes	• Chemical waste of any kind shall be disposed of at an approved appropriate landfill site and in accordance with local legislative requirements. The Contractor shall obtain needed disposal certificates. • The removal of asbestos-containing materials or other toxic substances shall be performed and disposed of by specially trained and certified workers. • Used oil and grease shall be removed from site and sold to an approved used oil recycling company. • Used oil, lubricants, cleaning materials, etc. from the maintenance of vehicles and machinery shall be collected in holding tanks and removed from site by a specialized oil recycling company for disposal at an approved hazardous waste site. • Used oil or oil-contaminated materials that could potentially contain PCBs shall be securely stored to avoid any leakage or affecting workers. The Danang DONRE must be contacted for further guidance. • During the bridge construction phase, culverts welding waste should be collected as hazardous waste and sold/ collected by functional agencies treating hazardous waste. • Unused or rejected tar or bituminous products shall be returned to the supplier's production plant. • Relevant agencies shall be promptly informed of any accidental spill or incident. • Store chemicals appropriately and with appropriate labeling • Appropriate communication and training programs should be put in place to prepare workers to recognize and respond to workplace chemical hazards • Prepare and initiate a remedial action following any spill or incident. In this case, the contractor shall provide a report explaining the reasons for the spill or incident, remedial action taken, consequences/damage from the spill, and proposed corrective actions.	• Decision No. 23/2006/QD-BTNMT with list of hazardous substance • Circular No. 12/2011/TT-BTNMT dated 14 April 2011 on management of hazardous substance
25. Management of sludge	• Dredging plan should be established including time schedule, method statement to meet the requirements of traffic safety, public health, and environmental sanitation. In order to ensure dredging that is consistent with environmental regulations, key decision makers (local authority, DONRE, utility company, Construction Supervision Consultant, etc.) must be involved and concur in each key decision point in the process leading to	• Decision No. 23/2006/QD-BTNMT with list of hazardous substance • Decree No. 59/2007/ND-CP

Environmental and social issues	Mitigation measures	Vietnam's regulations
	preparation and implementation of a plan. • Characteristics of sludge/sediment should be determined by sampling and analysis if not already fully evaluated during the EIA. Sludge that is heavily contaminated would require measures that go beyond the scope of these ECOPs. • Ensure that dredged material management plans incorporate environmental considerations in the identification of short-term and long-term disposal alternatives, consider methods to reduce dredging, and maximize the beneficial use of dredged materials. • The dredging should be implemented before water level rises. • Lixiviate from dredged materials should not be allowed to enter watercourses without appropriate filtering or treatment. • Collected dredged materials have to be processed, as per Vietnamese regulations on waste collection, to ensure safe and environmentally secure transportation, storage, treatment and management • Agencies involved in handling of sludge should be specialized and have certification of sludge handling. Guidelines for certification of sludge handling according to the Circular No. 12/2011/TT-BTNMT on management of hazardous substance. • Sanitary landfill site should meet technical requirements, based on level of potential contamination.	dated 09 April 2007 on solid waste management • Decree No. 38/2015/ND-CP dated 24 April 2015 on management of waste and scraps.
26. Disruption of vegetative cover and ecological resources	• The Contractor shall prepare a Clearance, Revegetation and Restoration Management Plan for prior approval by the Construction Engineer, following relevant regulations. The Clearance Plan shall be approved by Construction Supervision Consultant and followed strictly by contractor. Areas to be cleared should be minimized as much as possible. • The Contractor shall remove topsoil from all areas where topsoil will be impacted on by rehabilitation activities, including temporary activities such as storage and stockpiling, etc; the stripped topsoil shall be stockpiled in areas agreed with the Construction Supervision Consultant for later use in re-vegetation and shall be adequately protected. • The application of chemicals for vegetation clearing is not permitted.	• Law on Environment protection No. 55/2014/QH13

Environmental and social issues	Mitigation measures	Vietnam's regulations
	• Prohibit cutting of any tree unless explicitly authorized in the vegetation clearing plan. • When needed, erect temporary protective fencing to efficiently protect the preserved trees before commencement of any works within the site. • Area of potential importance as an ecological resource should not be disturbed. This could include areas of breeding or feeding of birds or animals, fish spawning areas, or any area that is protected as a green space. • The Contractor shall ensure that no hunting, trapping shooting, poisoning of fauna takes place.	
27. Traffic management	• Before construction, carry out consultations with local government and community and with traffic police. • Significant increases in number of vehicle trips must be covered in a construction plan previously approved. Routing, especially of heavy vehicles, needs to take into account sensitive sites such as schools, hospitals, and markets. • Installation of lighting at night must be done if this is necessary to ensure safe traffic circulation. • Place signs around the construction areas to facilitate traffic movement, provide directions to various components of the works, and provide safety advice and warning. • Using safe traffic control measures, including road/rivers/canal signs and flag persons to warn of dangerous conditions. • Avoid material transportation for construction during rush hour. • Passageways for pedestrians and vehicles within and outside construction areas should be segregated and provide for easy, safe, and appropriate access. Signpost shall be installed appropriately in both water-ways and roads where necessary.	• Law on traffic and transportation No. 23/2008/QH12 • Law on construction No.16/2003/QH 11 • Circular No.22/2010/TT-BXD dated 03 Dec., 2010 on labor safety during the construction of civil works.
28. Interruption of utility services	• Planned and unplanned interruptions to water, gas, power, internet services: the Contractor must undertake prior consultation and contingency planning with local authorities about the consequences of a particular service failure or disconnection. • Coordinate with relevant utility providers to establish appropriate construction schedules. • Provide information to affected households on working schedules as well as planned disruptions (at least 5 days in advance).	• Decree No. 73/2010/ND-CP on administrative penalization security and society issues

Environmental and social issues	Mitigation measures	Vietnam's regulations
	• Interruptions of water supply to agricultural areas must also be avoided. • The contractor should ensure alternative water supply to affected residents in the event of disruptions lasting more than one day. • Any damages to existing utility systems of cable shall be reported to authorities and repaired as soon as possible.	
29. Restoration of affected areas	• Cleared areas such as borrow pits which are no longer in use, disposal areas, site facilities, workers' camps, stockpiles areas, working platforms and any areas temporarily occupied during construction of the project works shall be restored using landscaping, adequate drainage and revegetation. • Start revegetation as soon as possible. Appropriate local native species of vegetation shall be selected for the planting and restoration of the natural landforms. • Spoil heaps and excavated slopes shall be re-profiled to stable batters, and grassed to prevent erosion; • All affected areas shall be landscaped and any necessary remedial works shall be undertaken without delay, including green-spacing, roads, bridges and other existing works • Trees shall be planted at exposed land and on slopes to prevent or reduce land collapse and keep stability of slopes • Soil contaminated with chemicals or hazardous substances shall be removed and transported and buried in waste disposal areas. • Restore all damaged road and bridges caused by project activities.	• Law on Environment protection No. 55/2014/QH13

Environmental and social issues	Mitigation measures	Vietnam's regulations
30. Worker and public Safety	• Contractor shall comply with all Vietnamese regulations regarding worker safety. • Prepare and implement action plan to cope with risk and emergency • Preparation of emergency aid service at construction site • Training workers on occupational safety regulations • Ensure that ear pieces are provided to and used by workers who must use noisy machines such as piling, explosion, mixing, etc., for noise control and workers protection. • During demolition of existing infrastructure, workers and the general public must be protected from falling debris by measures such as chutes, traffic control, and use of restricted access zones. • Install fences, barriers, dangerous warning/prohibition site around the construction area which showing potential danger to public people • The contractor shall provide safety measures as installation of fences, barriers warning signs, lighting system against traffic accidents as well as other risk to people and sensitive areas. • If previous assessments indicate there could be unexploded ordnance (UXO), clearance must be done by qualified personnel and as per detailed plans approved by the Construction Engineer.	• Circular No. 22/2010/TT-BXD dated 03 December 2010 on regulation of construction safety • Directive No. 02 /2008/CT-BXD on safety and sanitation issues in construction agencies • TCVN 5308-91: Technical regulation on safety in construction • Decision No. 96/2006/QD-TTg dated 04 May 2006 on management and implementation of bomb mine explosive material disposal.
31. Communication with local communities	• Maintain open communications with the local government and concerned communities; the contractor shall coordinate with local authorities (leaders of local wards or communes, leader of villages) for agreed schedules of construction activities at areas nearby sensitive places or at sensitive times (e.g., religious festival days). • Copies in Vietnamese of these ECOPs and of other relevant environmental safeguard documents shall be made available to local communities and to workers at the site. • Reduced playground space, loss of playing fields and car parking: The loss of amenities during the construction process is often an unavoidable source of inconvenience to users in sensitive areas. However, early consultation with	• Decree No. 73/2010/ND-CP on administrative penalization security and society issues

Environmental and social issues	Mitigation measures	Vietnam's regulations
	those affected, provides the opportunity to investigate and implement alternatives. • Disseminate project information to affected parties (for example local authority, enterprises and affected households, etc) through community meetings before construction commencement; • Provide a community contact channel from whom interested parties can receive information on site activities, project status and project implementation results; • Provide all information, especially technical findings, in a language that is understandable to the general public and in a form of useful to interested citizens and elected officials through the preparation of fact sheets and news release, when major findings become available during project phase; • Monitor concerns and requirements of community; • Respond to inquiries by telephone and in writing in a timely and accurate manner; • Inform local residents about construction and work schedules, interruption of services, traffic detour routes and provisional bus routes, blasting and demolition, as appropriate; • Provide technical documents and drawings to community, especially a sketch of the construction area and the EMP of the construction site; • Notification boards shall be erected at all construction sites providing information about the project, as well as contact information about the site managers, environmental staff, health and safety staff, telephone numbers and other contact information so that any affected people can have the channel to voice their concerns and suggestions.	
32. Chance find procedures	If the Contractor discovers archeological sites, historical sites, remains and objects, including graveyards and/or individual graves during excavation or construction, the Contractor shall: • Stop the construction activities in the area of the chance find; • Delineate the discovered site or area; • Secure the sites to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities or the Department of Culture, Sports and Tourism takes over;	• Law on Cultural Heritage 32/2009/QH12 • Law on amending and supplementing a number of articles of Law on Cultural Heritage 28/2001/QH10 • Decree No. 98/2010/ND-CP

Environmental and social issues	Mitigation measures	Vietnam's regulations
	• Notify the Construction Supervision Consultant who in turn will notify responsible local or national authorities in charge of the Cultural Property of Viet Nam (within 24 hours or less); • Relevant local or national authorities would be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values; • Decisions on how to handle the finding shall be taken by the responsible authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance) conservation, preservation, restoration and acquisition; • If the cultural sites and/or relics are of high value and site preservation is recommended by the professionals and required by the cultural relics authority, the Project's Owner will need to make necessary design changes to accommodate the request and preserve the site; • Decisions concerning the management of the finding shall be communicated in writing by relevant authorities; • Construction works could resume only after permission is granted from the responsible local authorities concerning protection of the heritage.	dated 21/09/2010 of the Government on implementing a number of articles of Law on cultural heritage and Law on amendment and supplementation of a number of articles of Law on cultural heritage.

6.1.2. Site-specific impact mitigation measures

The table below presents site-specific impacts and mitigation measures that are not presented fully in ECOPs. This may be because the impact is not a typical one and not included in ECOPs (because the severity of the impacts goes beyond the scope of the mitigation measures in the ECOPs, or because simply of the very specific nature of the mitigation measures that are needed).

Table 6-2: The site specific impacts and mitigation measures for each position

Detailed design phase	
Impacts:	• Risks of local flooding during the construction and operations • Impacts on traffic safety • Risk of hill landslide in the process of construction and operation
Mitigation measures:	• Ensure that designing of Road DH2 takes into account suitable ground elevation to adapt to climate change impacts under scenarios that MONRE forecasted, especially in cases where heavy rains occur and prolong,

	combined with high tides and sea level rise causing flooding. • For the section through the area of low hills, risk of local prone- landslides area at some point may occur, but will be overcome in the process of the survey of design / construction consultants. The area will be changed or reinforced with assured ground, taking into the embankment if needed • Ensure temporary box culverts to be installed for any natural flow that works passes over. • At-grade or grade intersections with National highway 14B, Hoang Van Thai road, provincial road DT602 and DT604) should be designed reasonably to ensure synchronized traffic and prevent the risk of traffic accidents that might occur. • Detailed design includes full items for ensuring traffic safety, including signs, lightings and lane lines.
Implementation mechanism	Conditions of contracts, specifications mentioned in TOR and Bidding documents for Design Consultant
Responsible by	PMU/ Detailed design consultant
Monitored by	PMU, Department of Construction
Funding source	IDA
Pre-construction phase	
Mitigation measures:	• Implement the approved RAP in accordance with correspondent provisions.
Implementation mechanism	The approved RAP
Responsible by	PMU
Funding source	Dang city
Monitored by	Independent monitoring consultant
Construction phase	
Impacts during the relocation of electric poles	
Impacts	• Impacts on safety, electricity supply suspension due to relocation of electric poles
Mitigation measures	• Prepare plans for dismantling and notify the people, production facilities around the area of the dismantling time and electricity supply suspension. • Coordinate with the relevant authorities in the dismantling, proper use of specialized workers for the dismantling to avoid risks.
Implementation mechanism	Conditions of contracts, specifications, combined with conditions in ECOPs
Responsible by	Contractor coordinates with local electricity units
Monitored by	PMU/ Construction Supervision Consultant, Local Electricity Company.
Funding source	IDA
Impacts during the construction and improvement of Road DH2	
Impacts:	• Site clearance includes cleaning trees and vegetable cover beyond right of way of the construction site. • Large amount of land required to fill up the roadbed. • Blocked natural flows • Danger in the construction site for residential areas and other areas outside

	the construction site. • Vibration from machinery causes damage to adjacent buildings. • Concrete and asphalt mixing plants (if being built at the site) will generate exhaust gas and wastewater, leading to pollution.
Mitigation measures	• Ensure that contractors prepare and implement the site-specific environmental management plan (as required in the contract) for each aspect of the works - site clearance, earthworks, temporary and long term drainage, sidewalk paving, site and traffic safety. Namely, in addition to the generic requirements set out in ECOPs, it is required to: - Ensure not cut trees outside the right of way. - Ensure that from starting the construction, the drainage is prioritized. Drainage system consists of drains, sand traps and flow reduction structure, etc. - Ensure that material mines to be exploited, operated, closed and restored in manner for excavation positions in the project works and included in requirements of the contracts and the Environmental Management Plan (EMP). - Ensure that the road base is built systematically to avoid repeated transportation and stable construction surface right after completion. - Ensure that protection measures to be determined in the contract, including natural methods such as planting grass, shrubs and artificial measures such as stone paving, concreting, reinforced fiber or geo-textile fabric suitably with the conditions in the construction site when the construction process is on-going or completed. - Ensure temporary box culverts to be installed for any natural flow that works passes over. - Ensure that equipment of repairing machines and warehouses of materials and machines, such as material processing factory located in the positions far from canals, ditches, rivers, streams, residential areas and other sensitive areas. - Ensure that all drivers and operators of machines must be qualified and have certification of practices and trained and comply with the traffic management plan. - Ensure that machines such as concrete and asphalt mixing plant to be equipped with dust collection system, to be operated and maintained according to standards and connected with canals, ditches to sediment and waste collection holes, traps for preliminary wastewater treatment. - Gathering machinery, materials, mixing must put away from the location, sensitive projects such as schools, churches, temples on the route. Construction activities must be calculated so as not to affect the festivals, religious activities - The gathering of machinery, materials, batching must be put away from the location, sensitive works such as schools, churches, temples on the route. Construction activities must be calculated so as not to affect the festivals, religious activities
Implementation mechanism	Conditions of contracts, specifications, combined with conditions in ECOPs
Responsible by	Contractor
Funding source	IDA
Monitored by	Monitoring Consultant/ PMU

Operation phase	
Impacts:	• Increased traffic accidents due to higher standards allow rapider and more traffic. • Sidewalk, road-base slope and drainage system is damaged early due to inadequate maintenance. • Road pavement damage due to overload transportation of trucks. • Local flooding.
Mitigation measures	• Ensure that traffic safety conditions, including signs, lights and lane markings to be installed during the construction will be maintained effectively and long-term and replaced, if necessary. • Ensure that the city's operation and maintenance plan and related budget shall be considered adequately to keep original status of road. • Ensure that with the support of traffic management agency, overload trucks will not be allowed to travel on road. • The intersections with canals/ditches will be returned by culverts with similar dimensions.
Implementation mechanism	The City's operation and maintenance plan
Responsible by	Danang city Urban Highway Maintenance Company
Funding source	Danang city
Monitored by	Danang city

6.2. Roles and Responsibilities of Stakeholders

The environmental management requires the involvement of several stakeholders with different roles and responsibilities to ensure that adverse impacts are minimized during the implementation of the project. Stakeholders mainly involve the Project Management Unit (PMU), the agency in charge of environmental management under the PMU, the Environmental Supervision Engineers under the Construction Supervision Consultant (CSC) and the External Monitoring Consultant (EMC) as well as the Construction Contractor. The relations among stakeholders related to the environmental management of the project are shown in the figure bellowed:

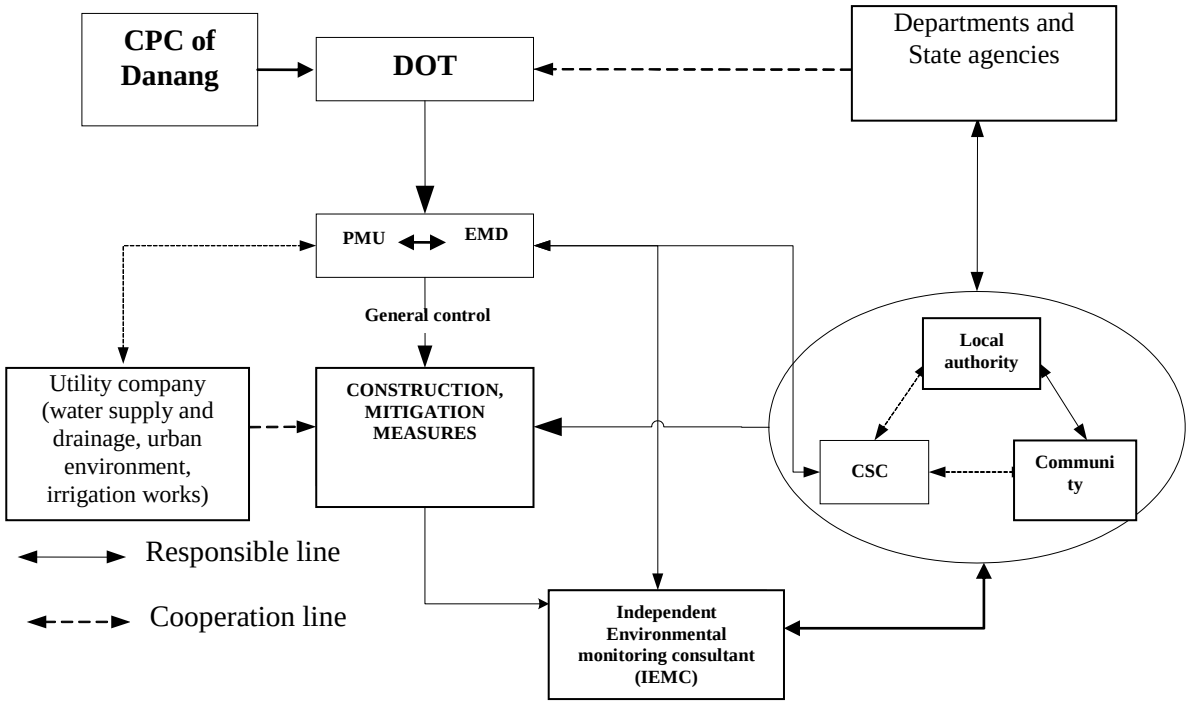


Figure 6-2: Environmental Management System during the Construction

Roles and responsibilities of stakeholders in the environmental monitoring system are presented in table below:

Table 6-3: Roles and Responsibilities of Stakeholders in Environmental Monitoring System

No.	Agency/Unit	Responsibilities
1	SCDP - PMU	The PMU will be in charge of monitoring and managing daily, including finding, signing the Contract on behalf of the DOT. The PMU will be responsible for financing environmental activities during the construction and operation. PMU will coordinate with local authorities; promote the participation of community during the project preparation and implementation. The PMU will be responsible for reporting the environmental management to the DONRE. To achieve effectiveness during the implementation, the PMU will arrange an environmental management system that is presented in the diagram in name of Environmental management system - PMU.
2	Environmental management department (EMD) under the management of PMU	This will be in charge of environmental management and established internally in the PMU and led by a director and some non-specialized staff of various departments. This department will be responsible for monitoring the compliance with WB's environmental safeguard policies in all stages, processed and all project items such as procurement, entering into construction contract, consultancy contract, reviewing reports, extraordinary field check, governing departments and solving incidents related

No.	Agency/Unit	Responsibilities
		to environmental management. This department will advise the leader of the PMU about environmental issues to ensure that the project meets requirements of WB's environmental safeguard policy.
3	Construction supervision consultant (CSC)	CSC will be responsible for monitoring and observing the construction activities and ensure the Contractor's compliance with contractual requirements and EMP. CSC will mobilize fully qualified staff (such as Environment Engineer), specializing in environmental protection and construction project management for conducting responsibilities and monitoring the Contractor's activities. Term of reference for CSC will be designated in the Contract signed between CSC and PMU.
4	Contractor	On the basis of the approved EMP, the Contractor will be responsible for preparing EMP for each construction site, submitting and receiving opinions from stakeholders, completing for approval and implementing. In addition, the construction activities will be granted with permits (traffic control and divergence, road excavation, labor safety, permit for yard of waste soil) in accordance with current regulations. The Contractor will appoint Safe and Environment Officers (SEO) who will be responsible for monitoring the contractor's compliance with requirements in EMP and environmental technical parameters. The EMP (approved) and relevant documents will be base of later management and monitoring.
5	Local authorities and affected communities	Local authorities in charge of local administrative management shall be responsible for appointing officers to manage/monitor project's activities, ensure absolute safety during the construction. Local authorities will organize, promote democracy, and monitor residents through arranging the community monitoring staff, establishing the mechanism of monitoring and reporting of mitigation measures of environmental impacts, labor safety, environmental sanitation and related issues. Representatives of community and local authorities will be supported by consulting firms of the PMU.
6	Independent Environmental monitoring consultant (EMC)	EMC is professional and experienced in environmental management. To extent of the Contract, EMC will support the PMU in establishing and operating the environmental management system, recommending adjustments and capacity building for stakeholders during the implementation and

No.	Agency/Unit	Responsibilities
		monitoring of the Contractor's compliance with the environmental management during the construction and commission, periodic monitoring in the construction phase. EMC will be responsible for supporting the PMU in preparing the EMP monitoring reports to submit the DONRE for approval. With knowledge and experience in environmental monitoring and auditing, implementation periodical monitoring in the process of construction.. EMC will provide professional, objective and independent instructions in environmental activities of the project. To minimize conflicts in rights, EMC will not be agency in charge of implementing EMP and independent of DOT, PMU, EMD or CSC.
7	Department of Natural Resources and Environment (DONRE)	DONRE, acting a role of state management for environment, DONRE will be responsible for receiving and verifying EMP submitted by PMU. In case of any arisen issues, DONRE will participate directly in consideration and handling related issues, minimize damages during the project implementation.
8	Department of Transport (DOT)	DOT, in coordination with DONRE, will regularly inspect the contractor's activities in accordance with current regulations. Especially, focusing on issues such as fence and signs, cleaning-up outside fence, road excavation, movement of vehicles, etc.
9	Danang City Environmental Police Department	Coordinating with the relevant Departments to investigate, control and resolve serious environmental violations. Especially, handling serious violations, monitoring and finding out responsibilities of stakeholders and resolving serious environmental incidents
10	Utility companies (electricity, water supply, water drainage, telecommunication)	Coordinate with PMU and construction contractors to move submerged pipelines, temporarily connect utility services at proposed locations to ensure the continuity of basic service provision to ensure daily life of local people. Resolve related accidents (electric cable fire or explosion, water pipeline break-through)

6.3. Monitoring the compliance with mitigation measures

The environmental monitoring program includes monitoring the compliance with mitigation measures and environmental quality monitoring.

Types of monitoring are shown below:

6.3.1. Monitoring the compliance with mitigation measures

Monitoring tasks of the Contractor and CSC, IEMC will be identified in the term of reference and contract will be approved by the World Bank. CSC shall be responsible for submitting the monthly report on environmental issues, actions and updated monitoring

results. Basing on the monthly reports and field surveys, the IEMC shall be responsible for preparing and submitting the semi-annual reports to the PMU for summarizing environmental issues and mitigation measures to be implemented. The quarterly report prepared by PMU includes:

- The priority isssues list is identified in the previous monitoring report.
- Measures taken by the Contractor for solving all issues arising.
- Outstanding issues and propose solutions and explanation of force majure.

The IEMC shall provide technical assistance and guidelines for the PMU and CSC for supporting them in monitoring the mitigation measures and submitting relevant reports.

6.3.2. Monitoring of environmental quality

The Environmental Monitoring Program is carried out in 3 phases of the project: Pre-construction (baseline environment); construction and operation (one first year of project operation). Furthermore, CMC and SEO will monitor daily and observing noise. IEMC will carry out periodical monitoring for sampling and analysis in laboratory as presented in the table bellowed. The monitoring positions are selected based on the construction progress and monitoring time.

The table belowed presents overview on the environmental monitoring program of the project during the construction and operation of the road:

Table 6-4: Parameters to be monitored during the project implementation

Items	Detailed monitoring	Positions	Frequency	No. of samples	Applicable standards
I	**Construction phase**				
Air quality monitoring	Parameters to be monitored as follows: - Noise LAeq - Total suspended particle TSP - Respiratory dust (PM10) - SO_2 - CO - NO_2	- At 3 positions as in Table 2.5 (air sampling)	Every 6 months	3 samples	QCVN 05:2013/BTNMT QCVN 26:2010/BTNMT
Monitor surface water quality at Tuy Loan River	The monitoring parameters : pH, TSS, DO, BOD5, COD, NH4, NO3, PO4, total grease, Coliform…	At 2 locations: - Surface water of Tuy Loan River is near Gang Bridge - Surface water at stream across DH2 road, intersecting with Ba Na- Suoi Mo road	Periodically 3 months/ time	2 samples	QCVN 08:2008-BTNMT
Wastewater quality	Parameters to be monitored:	- At the positions of discharging	Every 6 months	4 samples	QCVN 14:2008/BTNMT

Items	Detailed monitoring	Positions	Frequency	No. of samples	Applicable standards
monitoring	- pH - TSS - BOD_5 - H_2S - NO_3^-, PO_4^{3-} - Oil, grease - Coliform	construction and domestic wastewater at the site (4 positions). - At upstream and downstream of Tuy Loan River, section through Hoa Nhon commune			
II	**Operation phase**				
Air	Parameters to be monitored: - Noise - TSP - SO_2 - CO - NO_2	- At the intersection between road DH2 and NH 14B, provincial road DT602, Hoang Van Thai road, and some residential areas along the road (3 positions).	Every 6 months after operation of the project	6 samples (within 2 years)	QCVN 05:2013/BTNMT QCVN 26:2010/BTNMT

To ensure objectivity, science and reality of impacts during the project implementation (both positive and negative impacts), the environmental monitoring program shall be adjusted from time to time suitably with the site reality and project progress. Positions of observation points will be established on the basis of reference to observation position map established in the preparation of EIA report. In case the project is commenced for 1 year (since the time of approving EIA report, the observation data can be directly used as baseline data.

6.3.3. Monitoring reporting system

To ensure efficiency of information exchange, developing monitoring database of the implementing mitigation measures and efficiency of EMP, a standard reporting system at levels will be necessary. Form, frequency and responsibility for reporting are shown in the table bellowed:

Table 6-5: Environmental Monitoring Reporting System

No.	Issues to be reported	Level 1	Level 2 (a copy must be submitted to DONRE)	Level 3
I. Construction phase				
1	Implementation of mitigation measure in the site	Implementing agency: Contractor Frequency of reporting: Monthly Submitting to: PMU	Implementing agency: PMU Frequency of reporting: every 3 months Submitting to: MUDP	Implementing agency: MUDP Frequency of reporting: every 3 months Submitting to: WB

No.	Issues to be reported	Level 1	Level 2 (a copy must be submitted to DONRE)	Level 3
2	Monitoring HSET (health safety, environment and transport)	Implementing agency: Construction supervision consultant (CSC) Frequency of reporting: Monthly - Quarterly Submitting to: PMU	Implementing agency: PMU Frequency of reporting: every 3 months Submitting to: MUDP	Implementing agency: MUDP Frequency of reporting: every 3 months Submitting to: WB
		Implementing agency: Community monitoring team Frequency of reporting: Monthly Submitting to: Local authorities	Implementing agency: Local authorities Frequency of reporting: Any time if there are issues needed to be reflected Submitting to: PMU	
			Implementing agency: IEMC Frequency of reporting: every 3 months Submitting to: MUDP	
II. Operation phase				
1	Environmental monitoring and safety	Implementing agency: Urban management staff – Commune People's Committee. Frequency of reporting: monthly Submitting to: Leaders of project communes	Implementing agency: Local authorities (commune level) Frequency of reporting: every 6 months Submitting to: People's Committee of Hoa Vang district	Implementing agency: District People's Committee Frequency of reporting: Yearly Submitting to: DOC, CPC
2	Monitoring regional environment			Implementing agency: DONRE Frequency of reporting: Yearly Submitting to: Dang CPC

6.4. Compliance framework

A compliance framework is based on the environmental requirements established in the EMP and environmental specifications included in bidding documents (will be strictly enforced by CMC). Minor and major infringements will be determined according to the following categorization table:

Table 6-6: Category of Infringement & Remediation

Category of infringement	Definition	Remediation
Minor infringement	Incident which causes temporary but reversible damage to the environment, community property and people.	Minor clean up operations Adjustments/eliminations to construction practices Compliance with EMP

Major Infringement	Incident where there is long-term or irreversible damage to the environment, community property and people	Major clean-up operation Major restoration requiring engineering measures. Major restoration of community property. Compensation to affected communities or persons.

For minor infringements which cause temporary but reversible damage, the Contractor will be given a reasonable period of time to remediate the problem and to restore the environment. If restoration is done satisfactorily during this period, no further actions will be taken. If restoration action is not done during this period, the PMU will immediately arrange for another contractor to do the restoration, and deduct the cost from the offending contractor's next payment. For major infringements which cause long-term or irreversible damages, there will be a financial penalty in addition to the cost for restoration activities. To minimize the damages, the restoration activities will be implemented without delay.

The compliance framework will be applied as follows:

- The CMC will identify or be notified of an infringement (community member, local
- authority)
- The CMC in consultation with stakeholders will assess whether it is a minor or major infringement.

For minor infringements:

- The CMC will establish the required mitigation measures, and maximum time period of 05 days to remedy the situation.
- The CMC will review the recommendations and confirm (i) the level of infringement (minor/major); (ii) the mitigation measures; and (iii) the mitigation time period. If Chief Consultant does not agree these infringements, he/she will work with the PMU to reach mutually acceptable consensus.
- Contractor will be informed of the infringement, the required mitigation measures, and period for remedying incidents.
- The Contractor shall remedy the infringements in accordance with the recommendations within the agreed period.
- The CMC shall confirm the infringement which is satisfactorily remedied in the predetermined period and respond to local authorities/community.
- If the infringement is not remedied satisfactorily in the predetermined period, the PMU shall immediately arrange for a separate contractor to undertake the necessary works and the related costs shall be deducted from the next installment to the offending contractor.

For major infringements:

- The CMC shall immediately inform the PMU of the incident.
- The PMU shall inform the local authorities if appropriate.
- The PMU, in consultation with the CMC and other local authorities as appropriate, shall agree upon mitigation measures and clean up measures to be undertaken immediately by the contractor or by specialists to be employed at the contractor's expense. To minimize the environmental impacts, the restoration activities should be completed within ten days.

- The PMU shall apply a financial penalty, not to exceed 1% of the contract value, for each major infringement, in addition to any costs associated with the infringement not borne by the contractor.
- Any conflicts between the Contractor and CMC shall be resolved by the PMU.

6.5. Capacity building program

The capacity building program for the road DH2 project is a part of the capacity building program of the SCDP.

The actual implementation of the project showed that the coordination in environmental management is implemented with highest efficiency for following reasons:

- Lack of uniform coordination mechanism which is established firstly between the PMU and relevant agencies, especially in local authorities at project wards/communes level.
- Local staffs are not familiar with procedures of a funded-project but follow procedures of domestic projects with the limited participation.
- The community's awareness on rights and responsibilities for environmental protection is still limited or lack of a mechanism or specific tool for feedback.
- Relevant agencies are not actively willing to coordinate for implementing the project. Some agencies assigned their staff to follow up or coordinate with the project but in temporary manner because they are not familiar with coordination method and required procedures for exchange and coordination with the PMU.

To overcome these issues, analysis and evaluation of capability and demands of relevant agencies in the environmental management system (EMS), analysis of actual demands during project implementation is necessary.

Table 6-7: Analysis and determination of training demands

No.	Subject	Preliminary assessment on capability/awareness	Capacity building/training on environmental management
1	Functional staff of relevant public utility companies	Most staff have university/post university education level. There are many WB funded project executed in Danang city. Companies are quite familiar with requirement and procedure of WB's project.	- Need to be provided with project information and operation regime of EMS, contact clues, and cooperation mechanism between relevant agencies. - Need to be provided with detailed requirements on roles/responsibilities of these companies during coordination process on environmental management and solving arising environmental incidents.
2	Environmental management team - PMU	Have most staff with university/post university education, thus it is easy to them to comprehend new contents. Having working experiences in previous project but have not gone into details of the	- Should increase awareness on critical roles of EMS - Should provide with more knowledge/legal regulations related to penalty for violations on the environment. - Should be provided with treatment solutions for arising problems on

No.	Subject	Preliminary assessment on capability/awareness	Capacity building/training on environmental management
		environmental field. Have basic knowledge in information technology, thus, it will be convenient for data management and information process as well as cooperation with other agencies.	site. - Add more human resources to ensure the effective implementation in wide scale of project area. - Set up a program for site supervision regularly (at least once a month) - Required to participate in regular meetings (monthly) with CMC and Contractor.
3	Representative of local authorities	Apart from some central wards which participated in many infrastructure projects, other wards/communes have not been made sufficiently clear and understood about the project process. Computer skills are quite good. Remote contact and information exchange via email are applied. Awareness on community organization and monitoring is not clear. Community organization and monitoring have only been implemented for small projects which are invested by residents. Have no experience in the community monitoring on large scale.	- Should be provided with preliminary knowledge on environmental laws and contents related to coordination in monitoring among ward/commune authorities in projects which are executed in the areas. - Should be trained on community monitoring. - Should have updated information on project progress and monitoring and information exchange regime. - Especially, environmental management process should be made clear and comprehended before, during and after construction. - Need to be updated regularly on site issues (with the participation in official meetings)
4	Community's representatives	- Not been established in the local area, thus participants have not been determined - Most project areas are rural urbanizing with cultivation works. Education is limited and working style is primarily spontaneous. - Income of residents if not high; infrastructure system is not sufficient; awareness on rights and responsibilities of individuals and community on environmental issues are limited.	- Should be provided with rights and responsibilities in environmental management (as well as legal regulations.) - Should be provided with simple and official methods to be applied during project implementation process. - Raise the awareness of community on environmental management generally and potential impacts of the project in particular. - Continuously utilize project information and important points in EMS as well as operation regime.
5	Contractor	- Contractor's leaders are qualified and experienced staffs who are competent in legal regulations. - Periodically organize	- Should learn about environmental law and focus on contents related to roles of local authority and community supervisors. - Should comprehend environmental

No.	Subject	Preliminary assessment on capability/awareness	Capacity building/training on environmental management
		training courses on environmental sanitation and labor safety. - Most Contractors consider environmental issues to arise costs and do not want to implement them. - Awareness of Contractors on environmental issues during construction is limited. - Not have staff specialized in/trained on environmental management.	management process following requirements of WB's safeguard policies (for example, participation of EMC, implementation of HSET process). However, for contractors, these requirements will be followed through project documents and specific criteria in bidding documents as well as construction contract.

Based on an analysis of current capabilities, experiences and actual demands in project implementation, a capacity building and training program for relevant agencies is established as shown in the table below:

Table 6-8: Proposed programs on capacity building on environmental management

Training content	Subject to be trained	No. of trainees	Training time	Organization unit	Budget
Training on labor safety and environmental sanitation	Workers and technical staff of Contractor	All workers and staff on site	Prior to construction and following legal regulations	Contractor in coordination with Institute of Labor, War Invalid and Social Affairs	Paid by Contractor
Learning on general environmental management process	Staff of PMU and public utility companies	4 trainees	Prior to construction	PMU in coordination with EMC	Included in EMC contract package
Learning on CEMP process	Environmental staff under ward PC in the project area	1 district staff and 2x10 commune staffs	Prior to construction	PMU in coordination with EMC	Included in EMC contract
SEMP Learning on SEMP	CMC's staff in charge of environmental sanitation	5 - 10 trainees	Prior to construction	PMU in coordination with EMC	EMC

6.6. Cost estimate

6.6.1. Cost for implementing mitigation measures

Subject to the provisions in Vietnam laws, construction contractors must ensure the safety system of four basic criteria, including: Health, Safety, Environment and Transportation

The cost for the organization, training, communication, procurement and operation of equipments, manpower deployment, management etc. for the implementation of mitigation measures in and out of the site has been integrated in the construction package. The construction contractor will be responsible for research, plan and provide estimates for these activities. This will be one of the criteria to assess the capacity of the construction contractor as well as the basis for assessing the compliance of the construction contractor.

In case of violations, the owner may deduct fines and hire another company to participate in solving problems raised.

Table 6-9: Cost estimate of typical mitigation measures of the Contractor

Mitigation measures	Cost estimate
- Place tanks for storing temporary domestic solid waste (100 liter tank/site)	- 200,000VND/tank x 15 construction sites = VND 3,000,000
- Watering twice a day to minimize dust in the yard of materials and construction waste.	- 2 m^3/time x 2 times/day x 5,000đ/m^3 x 4 months x 26 days/month = VND 2,080,000
- Spray anti-odor EM (Effective Micro-organism) with one liter solution of EM/10m^3 of sludge	- 12,687m^3 x 10,000VND/liter of EM x 1l/10m^3 = VND 12,687,000
- Sign contract with Danang URENCO for collecting and treatment at the landfill.	- 12,687m^3 x 10,000 VND/m^3 = VND 126,870,000
- Purchase portable toilets	- VND 14,500,000 x 5 units = VND 72,500,000 *(unit price according to current market price)*
- Carry out preliminary survey for whole road and survey for 6 weak-structure buildings along the road (pulse position)	- VND 10,000,000/building x 6 buildings = VND 60,000,000
- Cost estimate and take remedy technical measures (within 5 days upon receipt of feedbacks) before construction commencement.	- VND 80,000,000 (contingency)
- Spreading lime powder on surface of yards of sludge dredging and excavation (average 1kg/1m^3)	- 27.408,3 m^3 of sludge x 1kg/1m^3 x 1.200VND/1kg = VND 32.889.960 - 71.566,98 m^3 of excavated soil x 1kg/1m^3 x 1.200đ/1kg = VND 85.880.376
- Average one pump and 100m flexible tube ∅20 /site of temporary drainage	- Pump: 15.000.000VND/pcs - Flexible tube: 100.000VND/m x 100m = VND 10.000.000 - Average 25.000VND/site
- Arrange 2 staffs to present regularly at intersections for traffic direction and divergence	- 2 staffs/site during the construction phase x 2.000.000VND/person/month
- Regularly consolidate the temporary road in two side of site for convenient travelling	- Consolidation cost (rolling, spreading ballast and compaction) 3.000.000 VND/road/month
- Inform construction schedule at the sensitive site and ensure progress. - Install road signs, beacons, arrange measure to ensure traffic safety and labor safety in accordance with regulations.	- Estimate 50,000 VND/site

(Note: Cost estimate for each mitigation measure)

6.6.2. Cost for Implementing Environmental Monitoring/Supervision Program

Cost of regular monitoring of Construction Supervision Consultant (CSC)

The contractor participating in the bidding package for CSC shall propose the organization of monitoring of the implementation of mitigation measures. CSC will be required to present their staff and specific working plan to manage the environmental hygiene and occupational safety on and around the site. Cost for this task will be proposed in the contract for CSC.

Cost of Operation of Community-based Monitoring System

As a rule of law in Vietnam, community monitoring system will be mainly engaged in the form of voluntary and there is no funding to support and through the Fatherland Front of the ward/commune.

The community organizations will receive support from the PMU through the Capacity Building program, providing the records, papers, and forms necessary for the effective supervision

Monitoring Cost of External Monitoring Consultant (EMC)

MUDP will contract with the EMC during construction of the project. EMC will deploy task for all components under TOR requirements.

Cost of implementing monitoring programs

Based on the scheduled monitoring program, cost for monitoring will be presented in the table below.

Table 6-10: Monitoring cost during the construction phase

No.	Sample	Quantity	Frequency (times)	Unit Price (VND)	Amount (VND)
1	Air environment	3 samples	02	1,710,000	10,260,000
2	Surface water	4 samples	04	1,080,000	17,280,000
3	Surface water environment	2 samples	02	1.594.000	3,188,000
4	Hiring car for sampling	2 days	02	2,000,000	8,000,000
5	Other costs				2,000,000
	Total				**40,728,000**

The implementation of monitoring in the construction phase conducted by EMC, will be negotiated, expanded contract with EMC of the whole current SCDP project.

Table 6-11: Monitoring cost during the operation phase

No.	Sample	Quantity	Frequency (times)	Price (VND)	Amount (VND)
1	Air environment	24 samples (6 positions x 2 times x 2 years)	Every 6 months (2 years = 4 times)	1,710,000	41,040,000
3	Hiring car for sampling				16,000,000
4	Other costs				2,000,000
	Total				**59,040,000**

Cost for environmental monitoring/observation in the two operating first years will be paid by Danang Bridge and Road Management Company. Then, the Environmental Monitoring Program may be included in the annual environmental monitoring program of Danang city

CHAPTER 7: PUBLIC CONSULTATION

7.1. Objectives of Public Consultation

- The consultation with the participation of local authorities and local people in the project site during preparation and implementation of EIA to provide essential information for further understanding about the project, impacts of the project implementation and potential mitigation measures for the project;
- Clarify issued discussed in the beginning period of the project;
- Inform profits achieved when the project is implemented;
- Provide subsidy for the project, state responsibilities and awareness of stakeholders, beneficiary people in the project site during the project implementation;
- Encourage the community participation in determining the environmental impacts of the project.
- Collect information about demands as well as correspondences of local people and authorities in the construction and recommendation in order to mitigate environmental impacts or considering adjustment in the engineering design stage
- The World Bank's operational policy (OP 4.01) on environmental impact assessment requires the affected people groups and local authorities to be provided with notification and consultation during the preparation of EIA.

7.2. Consultation and Information Dissemination

7.2.1. Public Consultation with Community in the project area

During the period from 11th to `12th of June 2014, the Consultant coordinated with Danang SCDP - PMU to conduct the public consultations in 2 project communes (including the representative of village head and affected households by the project) in project area. Consultation with affected communes by the road, namely:

- The villages in Hoa Nhon commune: Phuong Hung, Thach Nham Tay, Thai Lai, Phuoc Thai. The number of households taking part in consultation: 27hh

- The villages in Hoa Son commune : Xuan Phu, Phu Ha, Tuy Son, Phu Thuong. The number of households taking part in consultation: 18hh

The public consultation is to inform the local people of the project and consult them on project policies and their entitlements. Consultant also informs them of potential environmental negative impacts during the project implementation and proposed mitigation measures. The detailed consultation plan is shown in Table below:

Table 7-1. Plan of Public Consultation about EIA

No.	Location	Contents
1	**People's Committee of Hoa Nhon commune (11 June 2015) 27 hh**	Participation: - Representative of Da Nang SCDP PMU - Representative of local authorities - Representative of social organizations at local (Women's Association, Farmer Association Vietnamese Fatherland Front) - Representative of household in project area Part 1: Consultant's introduction about the Project - Introduction of the project: overview on project, investment purposes and alignment options crossing 2 communes. - Environmental impact assessment: including the environmental impacts arising and proposed mitigation measures, management model and implementation plan. - Resettlement Plan: including the impacts of land acquisition, site clearance compensation, and introducing the resettlement sites of the project. Part 2: Discussion - the parties contribute ideas to finish the proposed plans, the contents focus on: - Environmental Impact Assessment and Environmental Management Plan for the project area. - Resettlement plan and local people's needs of life restoration support, resettlement (survey by questionnaire). - All comments will be incorporated in Resettlement Action Plan and Environmental Management Plan before submitting to the relevant agencies for consideration and approval.
2	**People's Committee of Hoa Son commune (12 June 2015) 18 hh**	

Consultation at Phu Thuong Cathedral:

When implementing the project, a part of fence of Phu Thuong cathedral will be affected.

Consultant unit and representatives of PMU implemented consultation with representatives of Cathedral- Chau Ngoc Minh Vicar (Minute is attached at annex of the report). Representative of Cathedral agreed and supported for the project implementation, however, he suggested that:

- Adjustment alignment in order for Cathedral not to be affected.(avoid affecting main Cathedral's gate), road should be widen according to opposite location of Cathedral.

- Dong house is opposite to the cathedral(residence of Vicar) will be affected on fence when adjusting alignment. Chau Ngoc Minh Vicar agreed and supported for this change (please see minutes attached at annex of the report).

The Client and design unit got Chau Ngoc Minh Vicar's comments and researched, calculated plan according to Vicar's proposal at the same time.

7.2.2. Consultation with Local Authorities

Pursuant to the Government's Decree No. 18/2015/ND-CP on strategic environmental assessment, environmental impact assessment and environmental protection plan, the Client shall conduct consultations to collect comments from the local authorities – the Ward People's Committee and Fatherland Front.

EIA consultant coordinated with the Client's representative – PIIP PMU to send the Dispatch No. 570/BQL-NV dated 05 June 2015 on consultation during the preparation of EIA of the project and attach the Executive Summary of EIA report, including EMP to the People's Committees of two project communes. So far, the Project Owner received correspondence dispatches from these two communes.

7.3. Results of Public Consultation

7.3.1. Results of Public Consultation in the project area

Before conducting consultation in 2 affected communes, Da Nang SCDP PMU sent summary report of EIA projects, drafts to Hoa Nhon and Hoa Son People's Committee to get comments from local authorities and citizen. On the other hand, through two rounds of consultations hold in Hoa Nhon and Hoa Son People's Committee on 11th and 12th June 2015, the Consulting firm and the Project Owner recognized more comments from residents regarding the upgrading and improvement of the Road DH2. Main comments of community and feedbacks from the Client are summarized in the table bellowed:

Table 7-2: Results/ Opinions collected in the Public Consultations

No.	Commune	Issues/status	Recommendations of community	Feedbacks of PMU
1	Hoa Nhon commune	- Issues related to waste and environmental sanitation in the project area during the construction.	- Request the Client/Contractor to prepare the plan to minimize impacts from waste, domestic wastewater to the ambient environment. Prepare methods of shielding for vehicles of transporting materials.	- the PMU and Contractor will coordinate with the local authorities to ensure to avoid issues related to environmental pollution during the project implementation. Consultant will incorporate this content into EMP, EIA of the project and take proper mitigation measures.
		- Expansion and upgrading of the Road DH2 will affect housing and on-land architectural facilities of the local people.	- Appropriate and timely compensation and site clearance assistance for people to stabilize their life.	- PMU will ensure the compensation, site clearance to be implemented in accordance with the current regulations of the State, CPC and Donor.
		- The head section of the project is located in Hoa Nhon commune where the flooding	- The Client should study direction of flood drainage in rainy season to take suitable design alternatives such as intersection	- PMU recorded opinions of local people and will request the design consultant to finish and supplement to the detailed

No.	Commune	Issues/status	Recommendations of community	Feedbacks of PMU
		often occurs in rainy season due to water level rising on Tuy Loan river.	position, size of the works suitable with local demands, building of overbridge and crossing drainage sewer.	design of the project.
2	**Hoa Son**	Environmental sanitation in the project area and compensation, assistance and resettlement.	- Request the construction contractor to strictly comply with regulations on waste discharging. - Proper and timely compensation and site clearance assistance for local people to stabilize their life.	PMU will coordinate with local authorities and contractor to ensure the project will not cause environmental pollution. - In addition, PMU will ensure the compensation and site clearance to be carried out in accordance with the regulations of GoV and Donors.
		Intersection with local roads	When constructing at the intersections with local roads, the Contractor should take measures to ensure traffic safety for local people and minimize air pollution.	The Contractor shall notify the commune authorities and village chief of construction location and schedule and place warning signs at intersections.
		Affect cultural works, schools, recreation areas and markets.	Ensure safety for local people when constructing near these places. Avoid impacts on structures.	EMP preparing consultant incorporated appropriate mitigation measures into EMP. Simultaneously, the Client will suggest the Contractor to comply with mitigation measures and prior discuss with representatives of schools, communal health centers when constructing at these places to obtain the prior consensus before construction.
		Resettlement-related issues	Local people proposed to resettle nearby existing living place for convenience for job and life.	PMU commits to arrange resettlement at local people's expectations.

In conclusion, through the public consultation meeting, the local people supported the project and desired the project to be soon implemented. These comments are summarized as follows:

- All local people agreed with the project implementation, however, they request the construction to be carried out rapidly, limited to delay and extension and ensure environmental cleanness as well as compliance with tasks and ensuring quality of works;
- To mitigate potential impacts on the community and living conditions of the local people, the project components must be implemented rapidly and completed each section, limited to mass and unsystematic construction;
- Request the contractor to comply with commitments to mitigate negative environmental impacts caused by the project implementation;
- The local people requested the Project to make proper compensation and arrange resettlement for them at their expectation.
- In addition, the local people desired the PMU's and local authorities' support in vocational training and provision of preferential loan for them to timely recover living conditions.

7.3.2. Results of consultation with local authorities

In accordance with the correspondence dispatch and direct consultation with the People's Committees and Vietnam Fatherland Front of communes, some opinions are summarized as follows:

- People's Committees and Vietnam Fatherland Front of communes enthusiastically supported for the project implementation. Staff and consultant experts disseminated the project-related information and strategies, simultaneously introduced benefits from the project. When the project is completed, the local people will have great benefits on traffic, infrastructures and fresh environment.
- The local authorities will facilitate and support for implementation of the project, especially issues related to the land acquisition for the project implementation through site clearance and construction of work items
- People's Committees and Vietnam Fatherland Front of communes agreed with contents of the EIA report. Negative environmental impacts caused by the project are minor; however, it is essential to take mitigation measures of environmental adverse impacts.
- Agree with the mitigation measures of environmental pollution as mentioned in the project;
- Request the Client to commit to strictly implementing the mitigation measures of potential negative impacts such as environmental management and environmental quality monitoring.

7.4. Information Dissemination

The Project only receives the investment license after appropriate adjustments of location, designing, capacity and/or technology to meet environmental protection and resettlement requirements. Following requirements for information dissemination in OP 4.01, the PMU shall be on behalf of the project owner, shall:

i) Provide Vietnamese version of EIA report and the summary report to the office of Danang city People's Committee and People's Committees of Hoa Nhon and Hoa Son communes.

ii) EIA report (Vietnamese version) will be sent to PIIP-PMU and DONRE of Danang city.

iii) Disclose the summary of EIA report of the Project at 2 communes above and inform via mass media or the ward information board one month prior to dissemination of EIA report and the summary report. The Community can review and contribute their opinions about the EIA report by filling in the notebook within 1 month in working time at following places: 1) People's Committee of ward/communes; and 2) PMU.

iv) EIA report (English version) will be submitted to the World Bank for disclosure at VDIC and InfoShop in accordance with regulations on information dissemination policies.

CHAPTER 8: CONCLUSION, RECOMMENDATIONS AND COMMITMENT

1. CONCLUSION

On the basis of analysis and assessment on existing environment, environmental and socio-economic impacts in the project area, the report presents some following conclusions:

The Road DH2 under Component 3 of the Danang Sustainable City Development Project that Danang CPC is appointed to be Client and authorized the PIIP-PMU to manage.

Requirements of EIA report complied with Decree No. 18/2015/ND-CP dated 14 February 2015, Circular No. 27/2015/TT-BTNMT dated 18 July 2015 of the Minister of Natural Resources and Environment, guiding the implementation of strategic environmental assessment, environmental impact assessment and environmental commitment, WB's Environmental safeguard policies. EIA report identified and assessed all impacts of the project.

- After the project is completed, it will contribute to stabilizing the people's life, political security and social order in the region in particular and Danang city in general.
- Upgrading of low-income areas is not only economically feasible but also improvement of living conditions, environmental landscape for the region at present and in the future.
- The long-term construction and operation of the project will cause some negative environmental and socio-economic impacts unless the measures of prevention, control and handling of environmental pollution are not taken.
- During the operation of the Project, there will be some impacts but considered as unserious compared to benefits that Project brings.

Awareness of responsibilities for environmental protection, the Project will make sufficient investments in environmental protection and commit to strictly complying with the prevention, control and handling measures of environmental pollution as mentioned in EIA report to meet Vietnam environmental standards, including:

- Measure to control air pollution during the construction phase.
- Measure to control drainage of storm-water and wastewater, domestic wastewater treatment during the construction and operation phases.
- Measure to control solid waste pollution during the construction and operation phases.
- The PMU will coordinate with the functional agencies in the engineering designing and construction phases to timely adjust pollution level to meet environmental standards and prevent environmental incidents, if any.

The measures to control pollution and minimize adverse impacts on environment as mentioned in EIA report are feasible and meet Vietnam environmental standards issued.

The Project Owner shall be responsible toward the law for environmental issues of the project during the construction and operation.

2. RECOMMENDATIONS

- To ensure the Project to be put into operation quickly, the Client suggests the DONRE of Danang city and the functional agencies to appraise and submit Danang CPC for approving EIA report so that the Client can continue to implement next steps of the project and ensure investment progress of the project.
- The Client suggests the functional agencies to coordinate with the Client to monitor and solve environmental issues arising during the construction and operation of the project to ensure environmental safeguard and promote economic benefits of the project.
- The local authorities coordinate together in the propaganda and maneuver local people to support the project and raise community's awareness of environmental protection during the implementation and after the completion of the project.

3. COMMITMENTS

3.1. General commitments:

- The Client and PMU committed to implementing current regulations of Laws on Environmental Protection: Law on Environmental Protection 2014, Laws and relevant legal documents (the Government's Decree No.18/2015/ND-CP dated 14 February 2015 on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental management plan; the Government's Decree No.38/2015/ND-CP dated 24 April 2015 on management of waste and scrabs; the Government's Decree No. 88/2007/ND-CP dated 28 May 2007 on urban drainage) and WB's safeguard policies during the implementation and the project.

- The Client commits to complying with the mitigation measures of adverse impacts of the Project on environment during the construction preparation, construction and operation according to contents as mentioned in Chapter 4 of this Report.

- Project's activities shall be under the inspection of the competent authorities in charge of environmental management of DONRE of Danang city, Danang CPC and relevant functional agencies to ensure the project development and environmental protection.

- The Client commits to disclose contents of approved EIA report at the project locality to monitor the compliance with environmental protection commitment in the approved EIA report.

3.2. Commitment to complying with environmental standards and codes:

The Client commits to complying strictly with environmental standards and codes:

- Exhaust gas: In accordance with Vietnam standard QCVN 05:2013/BTNMT – National technical regulation on ambient air quality;

- Waste water: Commit to implementing mitigation measures and operation of waste water treatment system to ensure waste water treatment according to QCVN 14:2008/BTNMT (column B): National technical regulations on domestic waste water quality;

- Noise: Control noise in accordance with QCVN 26:2010/BTNMT – National technical regulation on noise.

- Solid waste: Solid waste will be collected and treated properly to ensure not drop down and exposure to ambient environment to ensure requirements for environmental sanitation and regulations in Decree No.59/2007/ND-CP dated 09 April 2007 of the Government on solid waste management.

- Hazardous waste: Commit to complying with Circular No. 12/2011/TT-BTNMT dated 14 April 2011 of MONRE on hazardous waste management.

3.3. Commitment to management and control of environmental pollution:

- The environmental management and control of environmental pollution will be given top priority during the construction and operation;

- The Client commits to coordinating with the functional agencies during designing, construction and operation of the treatment system and environmental protection;

- During the operation, the Client commits to implementing the environmental pollution management and control program in the project area as mentioned in this report and periodically reporting to the DONRE of Danang city.

- The Client commits for compensation and remedy of environmental pollution in case of environmental incidents and risks due to the project implementation;

- The Client commits to completing planned works, especially completion of the environmental treatment works after the EIA report is approved./.

REFERENCES

[1] Description report on FS of Component 3 – Strategic road development under Danang Sustainable City Development Project.

[2] FS and Basic Design of the Project "Improvement and Upgrading of Road DH2".

[3] The approved route direction drawings and land use boundary of the road DH2 from Hoa Nhon to Hoa Son.

[4] Topographic map 1/5.000 ratio of the studied area.

[5] Detailed planning of the transport system in Hoa Vang district.

[6] Summary report on implementation of socio-economic criteria, National Defense 2014 of Hoa Nhon and Hoa Son communes, Hoa Vang district, Danang city.

[7] Report on surveying, measuring, sampling and analyzing environmental conditions in the project area conducted by the Central Hydrometeorology Station on 14 June 2015.

[8] Environmental impact assessment of Hoa Phuoc – Hoa Khuong Road Project, 2014.

[9] Assessment on sources of air, water and land pollution – A guide to rapid source inventory techniques and their use in formulating Environmental Control Plan - WHO, 1993.

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[15] Vietnam construction sector standards: Design standard of the Ministry of Construction, TCVN 7957 2008 - Drainage and sewerage - External Networks and Facilities (for reference, hydraulic calculation and determination of depth of buried sewers.

[16] Guide to Sustainable Transportation Performance Measures, United States Environmental Protection Agency, Aug - 2011.

[17] US Federal High way Administration, Roadway construction noise handbook, 1/2006.

[18] WHO - Assessment of sources of air, water, and land pollution, A guide to rapid source inventory techniques and their use in formulating environmental control strategies. Part 1: Rapid Inventory Techniques in Environmental Pollution. Geneva, Switzerland, 1993.

ANNEXES

ANNEX 1: LEGAL DOCUMENTS RELATED TO THE PROJECT

ỦY BAN NHÂN DÂN
THÀNH PHỐ ĐÀ NẴNG

Số: 4945/QĐ-UBND

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự do - Hạnh phúc

Đà Nẵng, ngày 14 tháng 6 năm 2011

QUYẾT ĐỊNH

Về việc phê duyệt quy hoạch chi tiết xây dựng TL 1:500 cải tạo, nâng cấp đường ĐH2 (từ Hòa Nhơn đi Hòa Sơn)

CHỦ TỊCH ỦY BẠN NHÂN DÂN THÀNH PHỐ ĐÀ NẴNG

Căn cứ Luật tổ chức HĐND và UBND ngày 26 tháng 11 năm 2003;

Căn cứ Nghị định 08/2005/NĐ-CP ngày 24 tháng 01 năm 2005 của Chính phủ về quy hoạch xây dựng;

Căn cứ Quyết định số 19/2006/QĐ-UBND ngày 10 tháng 3 năm 2006 của UBND thành phố Đà Nẵng về việc ban hành Quy định về quản lý quy hoạch xây dựng đô thị trên địa bàn thành phố Đà Nẵng;

Xét nội dung Tờ trình số 760/TTr-GTNT ngày 31 tháng 5 năm 2011 của Ban Quản lý dự án Giao thông nông thôn về việc phê duyệt quy hoạch chi tiết TL 1:500 cải tạo, nâng cấp đường ĐH2 (từ Hòa Nhơn đi Hòa Sơn);

Theo đề nghị của Sở Xây dựng tại nội dung Tờ trình số 619/TTr-SXD ngày 01 tháng 6 năm 2011,

QUYẾT ĐỊNH:

Điều 1. Nay phê duyệt quy hoạch chi tiết xây dựng TL 1:500 cải tạo, nâng cấp đường ĐH2 (từ Hòa Nhơn đi Hòa Sơn), kèm theo bản vẽ Tổng mặt bằng quy hoạch chi tiết tỉ lệ 1:500 do Công ty Cổ phần Tư vấn Xây dựng và Đầu tư Trường Định lập với những nội dung chính sau:

1. Vị trí:

Tuyến đường quy hoạch thuộc các xã Hòa Nhơn, Hòa Sơn, huyện Hòa Vang, thành phố Đà Nẵng.

2. Ranh giới quy hoạch:

- Đầu tuyến : giáp Quốc lộ 14B (cũ) tại cầu Giăng;
- Cuối tuyến : giáp đường ĐT602 tại nút giao thông Tùng Sơn;
- Hai bên tuyến : giáp các khu công trình công cộng và dân cư dọc tuyến;

3. Quy mô:

Tổng diện tích đất quy hoạch: **190.212,6 m²**,

Tổng chiều dài tuyến: **9,228 m**,

Mặt cắt ngang đường: **20,5 m** (5 m + 10,5 m + 5 m),

Điều 2.

- Ban Quản lý dự án Giao thông nông thôn có trách nhiệm phối hợp với các ngành chức năng liên quan thực hiện các bước xây dựng cơ bản tiếp theo đúng quy định, đồng thời phối hợp với đơn vị tư vấn thực hiện việc cắm mốc ranh giới theo đồ án được duyệt.

- Giao UBND huyện Hòa Vang chủ trì, phối hợp với các đơn vị có liên quan, tổ chức việc bàn giao mốc giới, niêm yết và công bố công khai đồ án quy hoạch được duyệt theo quy định. Thời hạn bàn giao mốc không quá 15 ngày kể từ ngày ký Quyết định này.

- Giao Sở Xây dựng, UBND huyện Hòa Vang quản lý quy hoạch được duyệt theo đúng chức năng và nhiệm vụ được giao.

- Giao Sở Tài nguyên - Môi trường căn cứ Tổng mặt bằng được duyệt lập thủ tục thu hồi đất, giao đất theo đúng quy định.

Điều 3. Quyết định này có hiệu lực thi hành kể từ ngày ký.

Điều 4. Chánh Văn phòng UBND thành phố Đà Nẵng; Giám đốc các Sở: Xây dựng, Tài nguyên-Môi trường, Giao thông Vận tải; Chủ tịch UBND huyện Hòa Vang; Chủ tịch UBND các xã: Hòa Nhơn, Hòa Sơn; Trưởng ban Quản lý dự án Giao thông nông thôn; Thủ trưởng các đơn vị và cá nhân có liên quan căn cứ Quyết định thi hành./.

Nơi nhận:
- Như điều 4;
- CT và các PCT;
- Lưu: VT, P.QL Đô thị.

CHỦ TỊCH

Trần Văn Minh

ANNEX 2: TEST REPORT OF BASELINE ENVIRONMENTAL QUALITY MONITORING

1. Analytical results of air samples

TRUNG TÂM KHÍ TƯỢNG THUỶ VĂN QUỐC GIA
ĐÀI KHÍ TƯỢNG THUỶ VĂN KHU VỰC TRUNG TRUNG BỘ
NATIONAL HYDRO-METEOLOGICAL SERVICE OF VIETNAM
MIDDLE OF CENTRAL PARTS HYDROMETEOROLOGICAL SERVICE
Địa chỉ: 660 Trưng Nữ Vương - quận Hải Châu TP Đà Nẵng
Tel: 0511.3618295- 2248116; Mobile: 0914020238, 0976247996
Email: hmceal@gmail.com; Web: kttvttb.vn

VILAS 423 | VIMCERTS 036

Số/ Ref:282.10/2015/ML Ngày/Date:19/6/2015

PHIẾU KẾT QUẢ THỬ NGHIỆM
Test report

(Phiếu kết quả này không được lập lại nếu không được sự đồng ý bằng văn bản của PTN)
(This test report not be reproduced without the written approval of Laboratory)

1- Tên mẫu/*Name of sample* : Mẫu không khí
2- Kỹ hiệu mẫu/*Mark of sample* : K1, K2, K3
3- Số lượng mẫu/*Quantity* : 03
4- Ngày nhận mẫu/*Date of receiving* : 14/6/2015
5- Đặc trưng tình trạng mẫu/*Characterization and condition of test sample*: *Dạng lỏng, rắn, khí*
6- Khách hàng/*Client* : Công ty TNHH Đầu tư & Tư vấn phát triển Việt Nam
7- Địa chỉ/ *Adress*: Số 50 Ngõ Huyện, P.Hàng Trống, Q.Hoàn Kiếm, Hà Nội
8- Kết quả thử nghiệm/*Test results*:

TT No	Tên chỉ tiêu (Test properties)	Phương pháp thử (Test methods)	Đơn vị tính (Unit)	Kết quả thử nghiệm (Test results)		
				K1	K2	K3
I/ Tiếng ồn						
1	Tiếng ồn (1)	TCVN 7878-2: 2010	dBA	65,8	55,7	62,3
III/ Bụi & hơi khí độc						
1	Bụi lơ lửng (1)	TCVN 5067:1995	mg/m^3	0,46	0,20	0,29
2	NO_2 (1)	TCVN 6137:2009	mg/m^3	0,084	0,046	0,052
3	SO_2 (1)	TCVN 5971:1995	mg/m^3	0,073	0,038	0,046
4	CO (1)	TCVN 7725:2007	mg/m^3	5,426	3,742	5,427

Ghi chú: - K1: Mẫu không khí lấy tại tuyến đường ĐH2: Khu dân cư thôn Thạch Nham Tây, xã Hòa Nhơn, gần cầu Giăng (QL14B) (16° 0'1.49"N;108° 8'29.67"E)
- K2: Mẫu không khí lấy tại tuyến đường ĐH2: Giao với đường Hoàng Văn Thái, Bà Nà-Suối Mơ (16° 1'36.17"N;108° 6'43.21"E)
- K3: Mẫu không khí lấy tại tuyến đường ĐH2: Khu dân cư ngã ba Tùng Sơn, xã Hòa Sơn, giao với đường Âu Cơ (16° 3'31.28"N;108° 5'52.33"E)
(1) Các chỉ tiêu đã được Bộ Tài nguyên và Môi trường: Chứng nhận đủ điều kiện hoạt động dịch vụ quan trắc và phân tích môi trường, số hiệu: VIMCERTS 036
- HD 5.5/02FSI: Quy trình nội bộ hướng dẫn thực hiện công việc phân tích trong PTN
- *Lấy mẫu ở độ cao 1,5 m so với mặt đất.*
- *Kết quả thử nghiệm chỉ có giá trị trên mẫu thử nghiệm.*
- *Sau thời hạn lưu mẫu 07 ngày kể từ ngày trả kết quả, PTN không giải quyết khiếu nại đối với mẫu thử.*

QUẢN LÝ CHẤT LƯỢNG | **TL.GIÁM ĐỐC**
TRƯỞNG PHÒNG THÍ NGHIỆM

VILAS **Đương Anh Điệp** | **Nguyễn Minh Thiên**

VIMCERTS 036: Bộ Tài nguyên và Môi trường: Chứng nhận đủ điều kiện hoạt động dịch vụ quan trắc và phân tích môi trường không khí, nước,đất, trầm tích, bùn
BM 5.10/02 Lần ban hành: 02

2. Analytical results of surface water samples

TRUNG TÂM KHÍ TƯỢNG THUỶ VĂN QUỐC GIA
ĐÀI KHÍ TƯỢNG THUỶ VĂN KHU VỰC TRUNG TRUNG BỘ
NATIONAL HYDRO-METEOLOGICAL SERVICE OF VIETNAM
MIDDLE OF CENTRAL PARTS HYDROMETEOROLOGICAL SERVICE
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VILAS 423 VIMCERTS 036

Số/ Ref:282.12/2015/ML Ngày/Date:19/6/2015

PHIẾU KẾT QUẢ THỬ NGHIỆM
Test report

(Phiếu kết quả này không được lập lại nếu không được sự đồng ý bằng văn bản của PTN)
(This test report not be reproduced without the written approval of Laboratory)

1- Tên mẫu/*Name of sample* : Mẫu nước mặt
2- Ký hiệu mẫu/*Mark of sample* : NM1, NM2
3- Số lượng mẫu/*Quantity* : 02
4- Ngày nhận mẫu/*Date of receiving* : 14/6/2015
5- Đặc trưng tình trạng mẫu/*Characterization and condition of test sample*: *Dạng lỏng*
6- Khách hàng/*Client* : Công ty TNHH Đầu tư & Tư vấn phát triển Việt Nam
7- Địa chỉ/ *Adress*: Số 50 Ngõ Huyện, P.Hàng Trống, Q.Hoàn Kiếm, Hà Nội
8- Kết quả thử nghiệm/*Test results*:

TT No	Tên chỉ tiêu (Test properties)	Phương pháp thử (Test methods)	Đơn vị tính (Unit)	Kết quả thử nghiệm (Test results)	
				NM1	NM2
1	pH[1][2][3]	TCVN 6492:2011	-	6,94	6,84
2	DO[1][2]	TCVN 7325: 2004	mg/L	5,68	6,78
3	TSS[1][2]	TCVN 6625:2000	mg/L	30,2	20,7
4	BOD_5[1][2]	TCVN 6001-1:2008	mg/L	6,7	4,9
5	COD[1]	SMEWW 5220C:2012	mg/L	15	11
6	NH_4^+-N[1][2]	SMEWW 4500 NH_3 B,F:2012	mg/L	0,527	0,297
7	NO_3^--N[1][2]	EPA 352.1	mg/L	0,621	0,276
8	NO_2^--N[1][2]	TCVN 6178: 1996	mg/L	0,004	0,003
9	PO_4^{3-}-P[1]	TCVN 6202:2008	mg/L	0,057	0,058
10	Dầu mỡ [1][2]	TCVN 5070:1995	mg/L	0,15	0,10
11	Colirorm[1]	TCVN 6187-2:2009	MPN/100mL	7500	3400

Ghi chú :
- NM1: Nước mặt sông Tây Loan tại Cầu Găng(15°59'57,04"N;108° 8'28,61"E)
- NM2: Nước mặt tại suối qua tuyến đường ĐH2, gần giao với đường Bà Nà-Suối Mơ(16° 1'35,25"N;108° 6'43,14"E)

(1) Các chỉ tiêu được Bộ Tài Nguyên và Môi Trường: Chứng nhận đủ điều kiện hoạt động dịch vụ quan trắc và phân tích môi trường, số hiệu: VIMCERTS 036.
(2) Các chỉ tiêu đã được văn phòng Công nhận Chất lượng Việt Nam: Công nhận VILAS 423.
(3) Các chỉ tiêu đã tham gia: Implementation of Inter-laboratory comparison projects-The Acid Depposition Moniioring Network in East Asia (Eanet-vn2)
- *Kết quả này chỉ có giá trị trên mẫu thử nghiệm*
- *Quá thời hạn lưu mẫu 07 ngày kể từ ngày ra, PTN không giải quyết việc khiếu nại kết quả thử nghiệm*

QUẢN LÝ CHẤT LƯỢNG — **Dương Anh Điệp**

TL.GIÁM ĐỐC
TRƯỞNG PHÒNG THÍ NGHIỆM — **Nguyễn Minh Thiên**

VIMCERTS 036: Bộ Tài nguyên và Môi trường: Chứng nhận đủ điều kiện hoạt động dịch vụ quan trắc và phân tích môi trường không khí, nước,đất, trầm tích, bùn
BM 5.10/02 Lần ban hành: 02

3. Analytical results of underground water samples

TRUNG TÂM KHÍ TƯỢNG THUỶ VĂN QUỐC GIA
ĐÀI KHÍ TƯỢNG THUỶ VĂN KHU VỰC TRUNG TRUNG BỘ
NATIONAL HYDRO-METEOLOGICAL SERVICE OF VIETNAM
MIDDLE OF CENTRAL PARTS HYDROMETEOROLOGICAL SERVICE
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VILAS 423 VIMCERTS 036

Số/ Ref:282.11/2015/ML Ngày/Date:19/6/2015

PHIẾU KẾT QUẢ THỬ NGHIỆM
Test report

(Phiếu kết quả này không được lặp lại nếu không được sự đồng ý bằng văn bản của PTN)
(This test report not be reproduced without the written approval of Laboratory)

1- Tên mẫu/*Name of sample* : Mẫu nước ngầm
2- Ký hiệu mẫu/*Mark of sample* : NN1, NN2
3- Số lượng mẫu/*Quantity* : 02
4- Ngày nhận mẫu/*Date of receiving* : 14/6/2015
5- Đặc trưng tình trạng mẫu/*Characterization and condition of test sample*: *Dạng lỏng*
6- Khách hàng/*Client* : Công ty TNHH Đầu tư & Tư vấn phát triển Việt Nam
7- Địa chỉ/ *Adress*: Số 50 Ngõ Huyện, P.Hàng Trống, Q.Hoàn Kiếm, Hà Nội
8- Kết quả thử nghiệm/*Test results*:

TT No	Tên chỉ tiêu (Test properties)	Phương pháp thử (Test methods)	Đơn vị tính (Unit)	Kết quả thử nghiệm (Test results)	
				NN1	NN2
1	pH(1)(2)(3)	TCVN 6492:2011	-	6,39	6,50
2	TS(Chất rắn tổng)	SMEWW 2540B:1995	mg/L	271,5	176,8
3	Độ cứng ($CaCO_3$)	SMEWW 2340C:2012	mg/L	86,250	90,125
4	COD($KMnO_4$)	TCVN 6186: 1996	mg/L	1,40	0,68
5	NH_4^+-N(1)(2)	SMEWW 4500 NH_3B,F:2012	mg/L	0,512	0,059
6	NO_3^--N(1)(2)	EPA 352.1	mg/L	1,715	5,741
7	SO_4^{2-}(1)(2)	SMEWW 4500 SO_4^{2-}E:2012	mg/L	98,75	79,54
8	Clorua(Cl^-)(1)(2)	TCVN 6494-1:2011	mg/L	35,460	24,576
9	Fe(1)(2)	TCVN 6177:1996	mg/L	0,165	0,228
10	As(1)(2)	TCVN 6626: 2000	mg/L	0,0012	0,0018
11	Coliform	TCVN 6187-2: 2009	MPN/100mL	16	KPH(<3)

Ghi chú : - KPH: Không phát hiện
- NN1: Nước ngầm tại thôn Thạch Nham Tây, xã Hòa Nhơn, gần cầu Giăng (QL14B) (16° 0'1,11"N;108° 8'30,18"E)
- NN2: Nước ngầm tại khu vực đường ĐH2 gần đường Bà Nà - Suối Mơ(16° 1'31,06"N;108° 6'42,85"E)
(1) Các chỉ tiêu được Bộ Tài Nguyên và Môi Trường: Chứng nhận đủ điều kiện hoạt động dịch vụ quan trắc và phân tích môi trường, số hiệu: VIMCERTS 036.
(2) Các chỉ tiêu đã được văn phòng Công nhận Chất lượng Việt Nam: Công nhận VILAS 423.
(3) Các chỉ tiêu đã tham gia: Implementation of Inter-laboratoty comparison projects-The Acid Depposition Moniioring Network in East Asia (Eanet-vn2)
- Kết quả này chỉ có giá trị trên mẫu thử nghiệm
- Quá thời hạn lưu mẫu 07 ngày kể từ ngày ra, PTN không giải quyết việc khiếu nại kết quả thử nghiệm

QUẢN LÝ CHẤT LƯỢNG
Dương Anh Điệp

TL. GIÁM ĐỐC
TRƯỞNG PHÒNG THÍ NGHIỆM
Nguyễn Minh Thiên

VIMCERTS 036: Bộ Tài nguyên và Môi trường: Chứng nhận đủ điều kiện hoạt động dịch vụ quan trắc và phân tích môi trường không khí, nước,đất, trầm tích, bùn
BM 5.10/02 Lần ban hành: 02

4. Analytical results of wastewater samples

TRUNG TÂM KHÍ TƯỢNG THUỶ VĂN QUỐC GIA
ĐÀI KHÍ TƯỢNG THUỶ VĂN KHU VỰC TRUNG TRUNG BỘ
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VILAS 423 VIMCERTS 036

Số/ Ref:282.13/2015/ML Ngày/Date:19/6/2015

PHIẾU KẾT QUẢ THỬ NGHIỆM
Test report

(Phiếu kết quả này không được lặp lại nếu không được sự đồng ý bằng văn bản của PTN)
(This test report not be reproduced without the written approval of Laboratory)

1- Tên mẫu/*Name of sample* : Mẫu nước thải
2- Ký hiệu mẫu/*Mark of sample* : NT1, NT2
3- Số lượng mẫu/*Quantity* : 02
4- Ngày nhận mẫu/*Date of receiving* : 14/6/2015
5- Đặc trưng tình trạng mẫu/*Characterization and condition of test sample*: *Dạng lỏng*
6- Khách hàng/*Client* : Công ty TNHH Đầu tư & Tư vấn phát triển Việt Nam
7- Địa chỉ/ *Adress*: Số 50 Ngõ Huyện, P.Hàng Trống, Q.Hoàn Kiếm, Hà Nội
8- Kết quả thử nghiệm/*Test results*:

TT No	Tên chỉ tiêu (Test properties)	Phương pháp thử (Test methods)	Đơn vị tính (Unit)	Kết quả thử nghiệm (Test results)	
				NT1	NT2
1	pH(1)(2)(3)	TCVN 6492:2011	-	6,56	6,84
2	TSS(1)(2)	TCVN 6625:2000	mg/L	40,6	38,1
3	COD(1)	SMEWW 5220C:2012	mg/L	26	35
4	NO_3^--N(1)(2)	EPA 352.1	mg/L	0,635	0,284
5	SO_4^{2-}(1)(2)	SMEWW 4500 SO_4^{2-}E:2012	mg/L	0,075	0,068
6	Fe(1)(2)	TCVN 6177:1996	mg/L	0,162	0,112
7	Pb(1)(2)	SMEWW 3113B:2012	mg/L	<0,0055	<0,0055
8	Cu(1)(2)	SMEWW3113B:2012	mg/L	0,0070	0,0075
9	Cd(1)(2)	SMEWW3113B:2012	mg/L	<0,0012	<0,0012
10	Hg(1)(2)	TCVN 7877:2008	mg/L	<0,0005	<0,0005
11	Cr^{3+}(1)	TCVN 6658:2000	mg/L	<0,02	<0,02
12	Colirorm(1)	TCVN 6187-2:2009	MPN/100mL	7500	12.10^3

Ghi chú : - KPH: Không phát hiện
- NT1: Nước thải tại khu vực thôn Thạch Nham Tây, xã Hòa Nhơn, gần Cơ sở mộc Dũng (16° 0'1,22"N;108° 8'31,02"E)
- NT2: Nước thải tại ngã ba đường ĐH2 và đường Âu Cơ, sau tạp hóa Diệu Linh(16° 3'35,53"N;108° 5'49,48"E)
(1) Các chỉ tiêu được Bộ Tài Nguyên và Môi Trường: Chứng nhận đủ điều kiện hoạt động dịch vụ quan trắc và phân tích môi trường, số hiệu: VIMCERTS 036.
(2) Các chỉ tiêu đã được văn phòng Công nhận Chất lượng Việt Nam: Công nhận VILAS 423.
(3) Các chỉ tiêu đã tham gia: Implementation of Inter-laboratory comparison projects-The Acid Depposition Monitoring Network in East Asia (Eanet-vn2)
- Kết quả này chỉ có giá trị trên mẫu thử nghiệm
- Quá thời hạn lưu mẫu 07 ngày kể từ ngày ra, PTN không giải quyết việc khiếu nại kết quả thử nghiệm

TL.GIÁM ĐỐC
QUẢN LÝ CHẤT LƯỢNG **TRƯỞNG PHÒNG THÍ NGHIỆM**

Dương Anh Điệp **Nguyễn Minh Thiên**

VIMCERTS 036: Bộ Tài nguyên và Môi trường: Chứng nhận đủ điều kiện hoạt động dịch vụ quan trắc và phân tích môi trường không khí, nước,đất, trầm tích, bùn
BM 5.10/02 Lần ban hành: 02

5. Analytical results of soil samples

TRUNG TÂM KHÍ TƯỢNG THUỶ VĂN QUỐC GIA
ĐÀI KHÍ TƯỢNG THUỶ VĂN KHU VỰC TRUNG TRUNG BỘ
NATIONAL HYDRO-METEOLOGICAL SERVICE OF VIETNAM
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Email: hmceal@gmail.com; Web: kttvttb.vn

VILAS 423 VIMCERTS 036

Số/ Ref:282.14/2015/ML Ngày/Date:19/6/2015

PHIẾU KẾT QUẢ THỬ NGHIỆM
Test report

(Phiếu kết quả này không được lập lại nếu không được sự đồng ý bằng văn bản của PTN)
(This test report not be reproduced without the written approval of Laboratory)

1- Tên mẫu/*Name of sample* : Mẫu đất
2- Ký hiệu mẫu/*Mark of sample* : Đ1, Đ2
3- Số lượng mẫu/*Quantity* : 02
4- Ngày nhận mẫu/*Date of receiving* : 14/6/2015
5- Đặc trưng tình trạng mẫu/*Characterization and condition of test sample*: *Dạng rắn*
6- Khách hàng/*Client* : Công ty TNHH Đầu tư & Tư vấn phát triển Việt Nam
7- Địa chỉ/ *Adress*: Số 50 Ngõ Huyện, P.Hàng Trống, Q.Hoàn Kiếm, Hà Nội
8- Kết quả thử nghiệm/*Test results*:

TT No	Tên chỉ tiêu (Test properties)	Phương pháp thử (Test methods)	Đơn vị tính (Unit)	Kết quả thử nghiệm (Test results)	
				Đ1	Đ2
1	Cd(1)	TCVN 6649:2009 + SMEWW 3113B:2012	mg/kg đất khô	0,248	0,275
2	As(1)	TCVN 6649:2009 + TCVN 8746:2010	mg/kg đất khô	0,184	0,167
3	Hg(1)	TCVN 6496:2009 + TCVN 8882:2011	mg/kg đất khô	KPH(<0,1)	KPH(<0,1)
4	Fe	TCVN 6649:2009 + TCVN 6177:1996	mg/kg đất khô	0,347	0,572
5	Pb(1)	TCVN 6649:2009 + SMEWW 3113B:2012	mg/kg đất khô	22,517	19,842
6	Cu(1)	TCVN 6649:2009 + SMEWW 3113B:2012	mg/kg đất khô	21,248	16,853

Ghi chú : - KPH: Không phát hiện
- Đ1: Mẫu đất tại khu vực thôn Thạch Nham Tây, xã Hòa Nhơn(16° 0'1,54"N;108° 8'28,09"E)
- Đ2: Mẫu đất tại ngã ba đường ĐH2 và đường Âu Cơ, song song với đường tránh QL1A (16° 3'32,06"E;108° 5'52,25"E)

(1) Các chỉ tiêu được Bộ Tài Nguyên và Môi Trường: Chứng nhận đủ điều kiện hoạt động dịch vụ quan trắc và phân tích môi trường, số hiệu: VIMCERTS 036.
- *Kết quả này chỉ có giá trị trên mẫu thử nghiệm*
- *Quá thời hạn lưu mẫu 07 ngày kể từ ngày ra, PTN không giải quyết việc khiếu nại kết quả thử nghiệm*

TL.GIÁM ĐỐC
QUẢN LÝ CHẤT LƯỢNG **TRƯỞNG PHÒNG THÍ NGHIỆM**

Dương Anh Điệp **Nguyễn Minh Thiên**

VIMCERTS 036: Bộ Tài nguyên và Môi trường: Chứng nhận đủ điều kiện hoạt động dịch vụ quan trắc và phân tích môi trường không khí, nước,đất, trầm tích, bùn
BM 5.10/02 Lần ban hành: 02

6. Analytical results of sediment samples

TRUNG TÂM KHÍ TƯỢNG THUỶ VĂN QUỐC GIA
ĐÀI KHÍ TƯỢNG THUỶ VĂN KHU VỰC TRUNG TRUNG BỘ
NATIONAL HYDRO-METEOLOGICAL SERVICE OF VIETNAM
MIDDLE OF CENTRAL PARTS HYDROMETEOROLOGICAL SERVICE
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VILAS 423 VIMCERTS 036

Số/ Ref:282.14/2015/ML Ngày/Date:19/6/2015

PHIẾU KẾT QUẢ THỬ NGHIỆM
Test report

(Phiếu kết quả này không được lập lại nếu không được sự đồng ý bằng văn bản của PTN)
(This test report not be reproduced without the written approval of Laboratory)

1- Tên mẫu/*Name of sample* : Mẫu trầm tích
2- Ký hiệu mẫu/*Mark of sample* : TT1, TT2
3- Số lượng mẫu/*Quantity* : 02
4- Ngày nhận mẫu/*Date of receiving* : 14/6/2015
5- Đặc trưng tình trạng mẫu/*Characterization and condition of test sample*: *Dạng rắn*
6- Khách hàng/*Client* : Công ty TNHH Đầu tư & Tư vấn phát triển Việt Nam
7- Địa chỉ/ *Adress*: Số 50 Ngõ Huyện, P.Hàng Trống, Q.Hoàn Kiếm, Hà Nội
8- Kết quả thử nghiệm/*Test results*:

TT No	Tên chỉ tiêu (Test properties)	Phương pháp thử (Test methods)	Đơn vị tính (Unit)	Kết quả thử nghiệm (Test results)	
				TT3	TT4
1	Cd(1)	TCVN 6649:2009 + SMEWW 3113B:2012	mg/kg đất khô	KPH(<0,2)	KPH(<0,2)
2	As(1)	TCVN 6649:2009 + TCVN 8746:2010	mg/kg đất khô	1,375	1,812
3	Hg(1)	TCVN 6496:2009 + TCVN 8882:2011	mg/kg đất khô	KPH(<0,1)	KPH(<0,1)
4	Fe	TCVN 6649:2009 + TCVN 6177:1996	mg/kg đất khô	0,276	0,384
5	Pb(1)	TCVN 6649:2009 + SMEWW 3113B:2012	mg/kg đất khô	22,384	19,752
6	Cu(1)	TCVN 6649:2009 + SMEWW 3113B:2012	mg/kg đất khô	21,942	15,792

Ghi chú : - KPH: Không phát hiện
- TT1: Mẫu trầm tích tại sông Tùy Loan khu vực thôn Thạch Nham Tây, xã Hòa Nhơn (16° 0'0,59"E;108° 8'27,91"E)
- TT2: Mẫu trầm tích tại suối qua tuyến đường ĐH2, gần giao với đường Bà Nà-Suối Mơ(16° 1'34,44"N;108° 6'42,86"E)
(1) Các chỉ tiêu được Bộ Tài Nguyên và Môi Trường: Chứng nhận đủ điều kiện hoạt động dịch vụ quan trắc và phân tích môi trường, số hiệu: VIMCERTS 036.
- Kết quả này chỉ có giá trị trên mẫu thử nghiệm
- Quá thời hạn lưu mẫu 07 ngày kể từ ngày ra, PTN không giải quyết việc khiếu nại kết quả thử nghiệm

QUẢN LÝ CHẤT LƯỢNG — **Dương Anh Điệp**

TL.GIÁM ĐỐC
TRƯỞNG PHÒNG THÍ NGHIỆM — **Nguyễn Minh Thiên**

VILAS 423

VIMCERTS 036: Bộ Tài nguyên và Môi trường: Chứng nhận đủ điều kiện hoạt động dịch vụ quan trắc và phân tích môi trường không khí, nước,đất, trầm tích, bùn
BM 5.10/02 Lần ban hành: 02

7. Analytical results of aquatic samples

TRUNG TÂM KHÍ TƯỢNG THUỶ VĂN QUỐC GIA
ĐÀI KHÍ TƯỢNG THUỶ VĂN KHU VỰC TRUNG TRUNG BỘ
NATIONAL HYDRO-METEOROLOGICAL SERVICE OF VIETNAM
MIDDLE OF CENTRAL PARTS HYDROMETEOROLOGICAL SERVICE
Địa chỉ: 660 Trưng Nữ Vương - quận Hải Châu TP Đà Nẵng
Tel: 0511.3618295 - 2248111; Mobile: 0914020238, 0976247996
Email: [illegible].com; Web: kttvttb.vn

VILAS 423 VIMCERTS 036

Số/ Ref:282.16/2015/ML Ngày/Date:19/6/2015

KẾT QUẢ MÔI TRƯỜNG HỆ THỦY SINH VẬT

1. Tên mẫu/ *Name of sample* : Mẫu thủy sinh
2. Ký hiệu mẫu/*Mark of sample* : TS1, TS2
3. Số lượng mẫu/*Quantity* : 02
4. Khách hàng/*Client*: Công ty TNHH Đầu tư & Tư vấn phát triển Việt Nam
5. Địa chỉ/*Address*: Số 50 Ngõ Huyện, P.Hàng Trống, Q.Hoàn Kiếm, Hà Nội
6. Kết quả điều tra:

TT	Chỉ tiêu	Kết quả	
		Ngành	Loài
I	TS1: Mẫu thủy sinh tại sông Túy Loan khu vực thôn Thạch Nham Tây, xã Hòa Nhơn TS2: Mẫu thủy sinh tại sông Túy Loan, cách cầu Giăng 2500m về phía thượng lưu		
1	Thực vật phiêu sinh		*Fragilaria capucina*
			Chaetocerus sp
		Bacillariophyta (tảo Silic)	*Closterium costaum*
			Thalassionema frauenfeldii
			Nitzschia brevirostris
			Synedra acus
		Chlorophyta (tảo Lục)	*Closterium intermedium*
			Endorina elegans
			Pandorina charkoviensis
			Eudorina elegans
			Dictyosphaerium tetrachotomum
			Monoraphidium caribeum Hindák
			Monoraphidium contortum (Thuret)
			Oocystis naegelii Braun
			Oocystis solitaria Wittrock
			Selenastrum gracile Reinsch
			Selenastrum rinoi Komárek and Comas
		Cyanobacteria (tảo Lam)	*Lyngbya birgei*
			Gomphosphaeria sp.
		Euglenophyta (tảo Mắt)	*Phacus sp*
2	Động vật phiêu sinh	*Arthropoda* (Chân khớp)	*Acanthodiaptomus* pacificus
			Alonella excisa
			Metapolycope hartmanni
			Daphnia pulex
			Heterocypris repetans

VIMCERTS 036: Bộ Tài nguyên và Môi trường: Chứng nhận đủ điều kiện hoạt động dịch vụ quan trắc và phân tích môi trường không khí, nước, đất, trầm tích, bùn
BM 5.10/02 Lần ban hành: 02

			Hyperia macrocephala
		Mollusca (Thân mềm)	*Clione antarctica*
			Clione limacina
			Paraclione longicaudata
			Prionoglossa tetrabranchiata
			Acteon candens
			Chrysallida cancellata
			Eulimella nitidissima
			Platydoris angustipes
		Chordata (Dây sống)	*Doliopsis bahamensis*
		Bivalviva (Hai mảnh vỏ)	*Cyclosalpa affinis*
		Chordata (Dây sống)	*Solen sp.*
			Solecurtus cumingianus.
			Solen viridis
			Solecurtus sanctaemarthae
3	**Động vật đáy**	*Mollusca* (Ngành thân mềm)	*Pomacea canaliculata* L.
			Corbicula sp.
			Pila polita
		Annelida (Giun đốt)	*Cirratulus cirratus*
			Phyllochaetopterus anglicus
			Glycera abranchiata
			Aricia cuvieri
			Eunoe pallida

Ghi chú:

- TS1: Mẫu thủy sinh tại sông Túy Loan khu vực thôn Thạch Nham Tây, xã Hòa Nhơn (108° 8'27.46"E;16° 0'1.46"N)
- TS2: Mẫu thủy sinh tại sông Túy Loan, cách cầu Giăng 2500m về phía thượng lưu (108° 7'43.27"E;16° 0'13.98"N)
- *Kết quả này chỉ có giá trị trên mẫu thử nghiệm*
- *Quá thời hạn lưu mẫu 07 ngày kể từ ngày ra, PTN không giải quyết việc khiếu nại kết quả thử nghiệm*

ANNEX 3: MINUTES OF THE PUBLIC CONSULTATION IN PROJECT AREA

3.1 Hoa Nhon

CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự Do - Hạnh phúc
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Đà Nẵng, Ngày 11 tháng 6 năm 2015

DỰ ÁN PHÁT TRIỂN BỀN VỮNG THÀNH PHỐ ĐÀ NẴNG

BIÊN BẢN HỌP THAM VẤN CỘNG ĐỒNG VỀ ĐÁNH GIÁ MÔI TRƯỜNG, TÁI ĐỊNH CƯ VÀ PHÁT TRIỂN XÃ HỘI

Hạng mục: Tuyến đường DH2
Phường/ xã: Hòa Nhơn ..quận/ huyện Hòa Vang.... thành phố Đà Nẵng

I. Thành phần tham dự

- Ông/Bà: Nguyễn Tiến Phát Chức vụ: CT UBND
- Ông/Bà: Đặng Đức Chanh Chức vụ: P.CT MTTQ
- Ông/Bà: Lê Văn Toàn Chức vụ: C.B địa chính
- Ông/Bà: Huỳnh Trung Thanh Chức vụ: C.B Ban QLDA
- Ông/Bà: Nguyễn Ngọc Trường Chức vụ: CB Tư vấn
- Ông/Bà: Nguyễn Quốc Hoàn Chức vụ: //
- Ông/Bà: Lại Việt Thắng Chức vụ: //
- Ông/Bà: ..... Chức vụ: .....
- Ông/Bà: ..... Chức vụ: .....
- Đại diện những người bị ảnh hưởng: .....người (*chi tiết xem danh sách đính kèm*)

II. Nội dung tham vấn

1. Giới thiệu dự án Phát triển bền vững thành phố Đà Nẵng hạng mục bổ sung.
2. Chuyên gia môi trường trình bày những tác động môi trường bao gồm tác động lên môi trường tự nhiên và xã hội của khu vực dự án và những biện pháp giảm thiểu các tác động tiêu cực.
3. Chuyên gia tái định cư trình bày về bồi thường, giải phóng mặt bằng cũng như những tác động khi thu hồi đất và các tài sản trên đất, những chính sách của Chính phủ nước Cộng hoà xã hội chủ nghĩa Việt Nam và địa phương, chính sách của dự án trong vấn đề bồi thường thiệt hại khi Nhà nước thu hồi đất đai và các tài sản trên đất.
4. Tư vấn chuẩn bị dự án tiến hành thu thập các thông tin, trao đổi với người dân trong khu vực về các vấn đề liên quan đến hiện trạng kinh tế-xã hội, môi trường, các vấn đề xã hội tích cực hoặc tiêu cực sẽ phát sinh khi xây dựng các công trình, ý kiến đóng góp của người dân trong quá trình thực hiện dự án.

1

III. Ý kiến thảo luận

III.1 Về các vấn đề thu hồi đất và các tài sản trên đất

- Việc xây dựng, nâng cấp tuyến đường ĐH2 ảnh hưởng một phần đến đất và các tài sản trên đất, hầu hết chủ yếu là đất ruộng, nhà cấp 4.
- Đa số người dân đồng tình với các chủ trương, chính sách của thành phố cũng như dự án về thu hồi đất và các tài sản trên đất

III.2 Các vấn đề về giới, hộ dễ bị tổn thương và hộ dân tộc thiểu số

Sự tham gia của phụ nữ và nam giới: phụ nữ và nam giới đều được tham gia vào các hoạt động đoàn thể, văn hóa, xã hội tại địa phương.

Vấn đề về buôn bán phụ nữ và trẻ em: Không có vấn đề về buôn bán phụ nữ và trẻ em tại địa bàn dự án

Các vấn đề xã hội liên quan: Không có các vấn đề xã hội phức tạp trên địa bàn dự án.

2

III. 3 Về các tác động môi trường tiêu cực và biện pháp giảm thiểu

- Việc xây dựng tuyến đường ĐH2 (từ xã Hòa Sơn đến xã Hòa Nhơn) giúp phát triển về giao thông, thuận tiện cho việc đi lại cũng như kết nối với các tuyến đường khác, phát triển kinh tế xã hội của địa phương. Tuy nhiên trong quá trình xây dựng có thể gây ra một số tác động tiêu cực đến môi trường như: ô nhiễm bụi, tiếng ồn, chất thải rắn, nước thải...
- Các biện pháp giảm thiểu các tác động tiêu cực của dự án đến môi trường đã trình bày chi tiết trong báo cáo ĐTM và EMP của dự án.
- Các tác động tiêu cực đến môi trường chủ yếu xảy ra trong giai đoạn thi công, các tác động này là tạm thời và đều giảm thiểu được.

IV. Kết luận

Chính quyền và người dân khu vực dự án đều đồng tình ủng hộ dự án, mong dự án nhanh chóng triển khai và sớm hoàn thành.

Đại diện Chủ đầu tư	Đại diện cộng đồng	Đại diện tư vấn	Đại diện UBND Phường
	Phú Mỹ Ngọc		CHỦ TỊCH Nguyễn Tấn Phát

CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM

Độc lập - Tự Do - Hạnh phúc

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DỰ ÁN PHÁT TRIỂN BỀN VỮNG THÀNH PHỐ ĐÀ NẴNG

DANH SÁCH CÁC ĐẠI BIỂU THAM DỰ CUỘC HỌP THAM VẤN CỘNG ĐỒNG VỀ ĐÁNH GIÁ MÔI TRƯỜNG, TÁI ĐỊNH CƯ VÀ PHÁT TRIỂN XÃ HỘI

Hạng mục: Đường ĐH2

Phường, xã: Hòa Nhơn – Huyện Hòa Vang – TP. Đà Nẵng

STT	Họ và tên	Địa chỉ	Chữ ký	Ghi chú
1.	Bùi Văn Chinh	BT, Chi bộ Phước Hưng		
2.	Bùi Văn Ngọc	Phước Hưng		
3.	Bùi Đắc Nam	Phước Hưng		
4.	Mạc Như Giáp	T Nham Tây		
5.	Lê Thị Thảo	T.N Tây		
6.	Đỗ Hữu Thanh	Thái Lai		
7.	LÊ DẪN	Thái Lai		
8.	Ng Tấn Nhất	CT-UB xã		
9.	Đỗ Hữu Bổng	Phước Hưng		
10.	Lê Bích Kiên	Phước Hưng		
11.	Đinh Ngọc Huyền	Thạch Nham Tây		
12.	Hồ Văn Tuấn	T Nham Tây		
13.	Đỗ Văn Tư	Thái Lai		
14.	Ngô Văn Chuyển	Phước Hưng		
15.	Ng Đăng Thanh	Thái		
16.	Nguyễn Thử	Th P/Hưng		
17.	Ng Tuấn	Phước Hưng		
18.	Phan Ngọc	P Thái		
19.	Nguyễn Ba	Thạch Nham Tây		
20.	Lê Tùng	Chợ Phước Thái		

1

STT	Họ và tên	Địa chỉ	Chữ ký	Ghi chú
21.	LÊ - VĂN - Thỏ	thôn thái lai		
22.	Đặng Thị [illegible]	Thôn phước Thái		
23.	Võ Hồng Lĩnh	p Thái		
24.	Nguyễn Thị Thanh	[illegible]		
25.	Đồng Đức Chi	KTNT - p Thái Hải		
26.	Đặng Công Hoa	Thôn Thái Lai		
27.	Nguyễn Song	Thôn phước Hưng		
28.	Lê Văn Toàn	cb địa chính xã		
29.	Trần công Châu	thạch nham tây		
30.	Huỳnh Trung Thành	Ban Quản lý Dự án		
31.				
32.				
33.				
34.				
35.				
36.				
37.				
38.				
39.				
40.				

.... Ngày ...11..... tháng ...6..... năm 2015

Xác nhận của địa phương

CHỦ TỊCH

Nguyễn Tấn Phát

2

3.2. Hoa Son

CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự Do - Hạnh phúc
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Đà Nẵng, Ngày 12 tháng 6 năm 2015

DỰ ÁN PHÁT TRIỂN BỀN VỮNG THÀNH PHỐ ĐÀ NẴNG

BIÊN BẢN HỌP THAM VẤN CỘNG ĐỒNG VỀ ĐÁNH GIÁ MÔI TRƯỜNG, TÁI ĐỊNH CƯ VÀ PHÁT TRIỂN XÃ HỘI

Hạng mục: Tuyến đường DH2
Phường/ xã: Hòa Sơn ,quận/ huyện Hòa Vang thành phố Đà Nẵng

I. Thành phần tham dự

- Ông/Bà: Trần Kim Anh — Chức vụ: CT UBND Huyện
- Ông/Bà: H'Đ Văn Y — Chức vụ: Chánh VP UBND Xã
- Ông/Bà: Hồng Xuân Phước — Chức vụ: P.C.T.X.D xã
- Ông/Bà: Huỳnh Tăng Thanh — Chức vụ: CB. BA.L.DA
- Ông/Bà: Nguyễn Quốc Khánh — Chức vụ: CB. T.N.MT
- Ông/Bà: Nguyễn Mạnh Tuấn — Chức vụ: //
- Ông/Bà: Lại Việt Thắng — Chức vụ: //
- Ông/Bà: ..... — Chức vụ: .....
- Ông/Bà: ..... — Chức vụ: .....
- Đại diện những người bị ảnh hưởng: .....người (*chi tiết xem danh sách đính kèm*)

II. Nội dung tham vấn

1. Giới thiệu dự án Phát triển bền vững thành phố Đà Nẵng hạng mục bổ sung.
2. Chuyên gia môi trường trình bày những tác động môi trường bao gồm tác động lên môi trường tự nhiên và xã hội của khu vực dự án và những biện pháp giảm thiểu các tác động tiêu cực.
3. Chuyên gia tái định cư trình bày về bồi thường, giải phóng mặt bằng cũng như những tác động khi thu hồi đất và các tài sản trên đất, những chính sách của Chính phủ nước Cộng hoà xã hội chủ nghĩa Việt Nam và địa phương, chính sách của dự án trong vấn đề bồi thường thiệt hại khi Nhà nước thu hồi đất đai và các tài sản trên đất.
4. Tư vấn chuẩn bị dự án tiến hành thu thập các thông tin, trao đổi với người dân trong khu vực về các vấn đề liên quan đến hiện trạng kinh tế-xã hội, môi trường, các vấn đề xã hội tích cực hoặc tiêu cực sẽ phát sinh khi xây dựng các công trình, ý kiến đóng góp của người dân trong quá trình thực hiện dự án.

1

III. Ý kiến thảo luận

III.1 Về các vấn đề thu hồi đất và các tài sản trên đất

- Dự án ảnh hưởng một phần đến đất thổ cư và tài sản trên đất, chủ yếu là nhà cấp 4 và cây ăn quả.
- Đa số người dân đồng tình với chủ trương, chính sách của thành phố và dự án về đền bù tái định cư.

III.2 Các vấn đề về giới, hộ dễ bị tổn thương và hộ dân tộc thiểu số

Sự tham gia của phụ nữ và nam giới: Phụ nữ và nam giới đều được tham gia vào các hoạt động đoàn thể, văn hóa, xã hội tại địa phương.

Vấn đề về buôn bán phụ nữ và trẻ em: Không có vấn đề về buôn bán phụ nữ và trẻ em tại địa phương

Các vấn đề xã hội liên quan: Trên địa bàn dự án không có các vấn đề xã hội phức tạp.

III. 3 Về các tác động môi trường tiêu cực và biện pháp giảm thiểu

- Xây dựng đường ĐH2 (từ xã Hòa Nhơn đến xã Hòa Sơn) có thể gây ra một số tác động tiêu cực đến môi trường như: ô nhiễm không khí, bụi, ô nhiễm chất thải rắn, tiếng ồn, nước thải... Tuy nhiên các tác động tiêu cực này phát sinh trong giai đoạn thi công và là tạm thời và có thể giảm thiểu được.
- Các biện pháp giảm thiểu các tác động tiêu cực đến môi trường nêu trên được trình bày chi tiết trong báo cáo ĐTM và EMP của dự án.

IV. Kết luận

Chính quyền địa phương và người dân đồng ủng hộ dự án, mong dự án nhanh chóng triển khai và hoàn thành.

Đại diện Chủ đầu tư	Đại diện cộng đồng	Đại diện tư vấn	Đại diện UBND Phường
	Nguyễn Đức Chạng	Lại Việt Thắng	CHỦ TỊCH Trần Kim Đính

CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM

Độc lập - Tự Do - Hạnh phúc

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DỰ ÁN PHÁT TRIỂN BỀN VỮNG THÀNH PHỐ ĐÀ NẴNG

DANH SÁCH THAM VẤN

Địa điểm:.....Xã Hòa Sơn.....Huyện Hòa Vang - TP. Đà Nẵng

Thời gian:.....12/6/2015.....

Hạng mục : Tuyến đường DH2

STT	Họ và tên	Địa chỉ	Chữ ký	Ghi chú
1.	Nguyễn Công	xuân phú hòa sơn		
2.	nguyễn Thên	phú ba hòa sơn		
3.	Nguyễn Hải	Xuân phú		
4.	Nguyễn Văn Đồng	Xuân phú		
5.	Trần Việt Hiệp	Tây Sơn		
6.	Đặng quốc Bảo	Tây Sơn		
7.	Nguyễn Tuấn	Tây Sơn		
8.	Nguyễn Minh	nt		
9.	Nguyễn Nhân	Thôn xuân phú		
10.	Đoàn TS Hải	Thôn Tây Sơn		
11.	Võ Thị nguyệt My	Thôn phú thượng		
12.	Vũ Nguyễn Anh	Thôn phú Thượng		
13.	NGÔ TẤN HUY	" phú Hạ		
14.	NGÔ NGỌC DƯƠNG	" phú Hạ		
15.	Nguyễn Đức Khanh	Phú Thượng		
16.	Nguyễn Minh	Tây Sơn		
17.	Trần Công Tín	Phú Thượng		
18.	Hồ văn Công	Phú Hạ		
19.	Hồng Xuân Phước	PCXD		
20.	Hồ Văn Y	VP HHND Xã		

STT	Họ và tên	Địa chỉ	Chữ ký	Ghi chú
20.	Huỳnh Trọng Thành	Ban QLDA		
21.	Trần Kim Đính	PBT-CT UBND		
22.	Lê Trinh	TT Phú Thứ		
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Ngày ..... tháng ..... năm 2015

Xác nhận của địa phương

CHỦ TỊCH

Trần Kim Đính

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3.3. Phu Thuong Cathedral:

CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự Do - Hạnh phúc
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Đà Nẵng, Ngày 28 tháng 10 năm 2015

DỰ ÁN PHÁT TRIỂN BỀN VỮNG THÀNH PHỐ ĐÀ NẴNG

BIÊN BẢN HỌP THAM VẤN CỘNG ĐỒNG VỀ ĐÁNH GIÁ MÔI TRƯỜNG, TÁI ĐỊNH CƯ VÀ PHÁT TRIỂN XÃ HỘI

Hạng mục: Tuyến đường DH2
Tham vấn Nhà thờ Phú thường
Phường/ xã Hòa Sơn ,quận/ huyện Hòa Vang thành phố Đà Nẵng

I. Thành phần tham dự

- Ông/Bà Phạm Đình Phi Chức vụ PCT xã Hoà Sơn
- Ông/Bà Võ Văn Sỹ Chức vụ CB địa chính
- Ông/Bà ..... Chức vụ .....
- Ông/Bà ..... Chức vụ .....
- Ông/Bà ..... Chức vụ .....
- Ông/Bà Châu Ngọc Minh Chức vụ Cha xứ nhà thờ Phú Thường
- Ông/Bà Nguyễn Đình Anh Chức vụ Trưởng ban đại diện
- Ông/Bà ..... Chức vụ .....
- Ông/Bà ..... Chức vụ .....
- Đại diện những người bị ảnh hưởng: .....người (*chi tiết xem danh sách đính kèm*)

II. Nội dung tham vấn

1. Giới thiệu dự án Phát triển bền vững thành phố Đà Nẵng hạng mục bổ sung.
2. Chuyên gia môi trường trình bày những tác động môi trường bao gồm tác động lên môi trường tự nhiên và xã hội của khu vực dự án và những biện pháp giảm thiểu các tác động tiêu cực.
3. Chuyên gia tái định cư trình bày về bồi thường, giải phóng mặt bằng cũng như những tác động khi thu hồi đất và các tài sản trên đất, những chính sách của Chính phủ nước Cộng hoà xã hội chủ nghĩa Việt Nam và địa phương, chính sách của dự án trong vấn đề bồi thường thiệt hại khi Nhà nước thu hồi đất đai và các tài sản trên đất.
4. Tư vấn chuẩn bị dự án tiến hành thu thập các thông tin, trao đổi với người dân trong khu vực về các vấn đề liên quan đến hiện trạng kinh tế-xã hội, môi trường, các vấn đề xã hội tích cực hoặc tiêu cực sẽ phát sinh khi xây dựng các công trình, ý kiến đóng góp của người dân trong quá trình thực hiện dự án.

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III. Ý kiến thảo luận

III.1 Về các vấn đề thu hồi đất và các tài sản trên đất

Việc triển khai thực hiện dự án sẽ ảnh hưởng đến đất đai và tường bờ dào của nhà dòng và cổng của nhà thờ.
Trước đây thì nhà thờ cũng đã biết về thông tin của việc triển khai thực hiện dự án.
Đại diện cha xứ đề xuất khi thực hiện làm đường thì nắn tuyến sang phía nhà dòng để tránh cổng nhà thờ.

III.2 Các vấn đề về giới, hộ dễ bị tổn thương và hộ dân tộc thiểu số

Sự tham gia của phụ nữ và nam giới:

Vấn đề về buôn bán phụ nữ và trẻ em:

Các vấn đề xã hội liên quan:
Trên địa bàn không có các vấn đề xã hội phức tạp như HIV, ma túy, bạo hành gia đình

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III. 3 Về các tác động môi trường tiêu cực và biện pháp giảm thiểu

Việc thực hiện dự án nếu thực hiện đúng theo phương án thiết kế sẽ ảnh hưởng đến đất đai và tường bờ dào và cổng của nhà thờ phú thường.

Đại diện nhà thờ và các hộ dân đề xuất tiến hành nắn tuyến để tránh ảnh hưởng đến cổng của nhà thờ, bởi nhà thờ đã xây từ năm 1987.

- Trong quá trình thi công dự án gây ra một số tác động tiêu cực như tiếng ồn, bụi, khói thải rắn do đó trong quá trình thi công cần che chắn để tránh rơi vãi vật liệu ra đường

IV. Kết luận

Đại diện, cha sứ nhà thờ Phú Thường và đại diện giáo dân hoàn toàn ủng hộ việc triển khai thực hiện dự án.

Tuy nhiên phải tiến hành nắn tuyến về phía tường bờ dào của nhà dòng để tránh cổng của nhà thờ.

Đại diện Chủ đầu tư	Đại diện cộng đồng	Đại diện tư vấn	Đại diện UBND Phường
	Châu Ngọc Minh		KT. CHỦ TỊCH PHÓ CHỦ TỊCH Phạm Đình Phi

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ANNEX 4: PICTURES OF PUBLIC CONSULTATION

Public consultation in Hoa Nhon commune

Public consultation in Hoa Son commune

Public Consultation in Hoa Son commune