

Socialist Republic of Vietnam

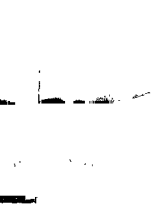
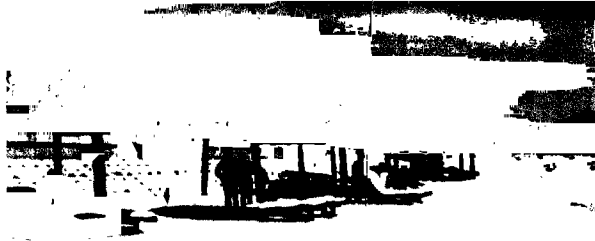


World Bank



**COASTAL CITIES ENVIRONMENTAL  
SANITATION PROJECT**

**Dong Hoi City Sub-Project,  
Phase 1**



**FINAL**

**ENVIRONMENTAL REPORT**

Environmental Assessment  
Environmental Management Plan  
Public Consultation

**May 2006**

Submitted by :

**THE Louis Berger Group, INC.**

L  
B

JV with **Nippon Koei CO., LTD**



Public Disclosure Authorized

Public Disclosure Authorized

## EXECUTIVE SUMMARY

### 1. INTRODUCTION

#### 1.1. Objectives of the Environmental Assessment (EA) Report

The objectives of the draft EA Report are to assess the potential environmental impacts of activities proposed in Phase 1 investment activities of the Dong Hoi City Sub-project under the Coastal Cities Environmental Sanitation Project (CCESP) and recommended needed mitigation and monitoring measures to address such impacts. Based on the Pre-Feasibility Study (Pre-FS) and CIP prepared for the sub-project, the draft EA was prepared to meet the requirements of both the Government of Vietnam (GoV) and the World Bank as part of the project preparation process. Potential social impacts of proposed Phase 1 activities are assessed in the separately submitted Resettlement Plan.

**Safeguard Policies of the World Bank:** In addition to procedures of environmental review and approval of the GoV, the CCESP shall be prepared and implemented in compliance with environmental and social safeguard policies of the World Bank. Based on these safeguard policies, the CCESP has been classified as a Category A type project due to the potential to cause significant environmental impact if proper assessment and mitigation measures are not applied. Specific Bank safeguard policies that were assessed during the EA study were:

- Environmental Assessment – Operational Procedure / Bank Procedure 4.01 (OP /BP 4.01)
- Natural Habitats (OP 4.04)
- Cultural Resources (draft OP 4.11 – OPN 11.03)

**Public Consultations:** As a Category A type project, two (2) stages of public consultations were carried out and documented in accordance with OP 4.01. A first stage of consultations was held in September - October 2005, involving focus group discussions and household surveys of some 300 households. A second stage of consultations was conducted on December 27, 2005 and involved 20 participants. This second stage of consultations was supplemented by a written questionnaire survey conducted on February 25, 2006 involving 20 households residing near the proposed Phase 1 discharge outlets.

**Public Disclosure:** As a Category A project, completed EAs must be available made to the public in accordance with BP 17.50. The draft EA was disclosed in Washington DC and the Vietnam Development Information Center (VIDC) in Hanoi on January 19, 2006. The Vietnamese translations of Executive Summary were disclosed by January 13, 2006. All documents were disclosed locally by the Provincial People's Committee (PCC), the provincial Department of Natural Resources and Environment (DONRE), the Project Preparation Units (PPUs), offices of the Wards in which people will be affected by the project, and were accessible to local NGOs and project affected people (PAPs).

## 2. PROJECT OUTLINE

### 2.1. Project's Objectives

Project's objectives in Phase 1: Objectives of the Phase 1 activities in Dong Hoi are as follows:

- Mitigate flooding and improve environment conditions in the City Center;
- Initiate a revolving fund for the improvement of household sanitation; and
- Strengthen the capability of the Project Management Unit (PMU).

### 2.2. Description of Proposed Project Components

Phase 1 (scheduled from 2007 to 2011) of the Dong Hoi sub-project will focus on the following main components and investment items:

Component 1: Drainage, Flood Control & Wastewater Collection – involving rehabilitation and improvement of some 22 km of existing pipes and drainage systems, rehabilitation of some 3.8 km of embankment along the Cau Rao River, Phong Thuy Channel and Nam Ly Pond, involving the dredging some 183,896 m<sup>3</sup> of materials from these waterways to restore their drainage capacity.

Component 4: Resettlement – involving compensation of the 47 project affected households currently residing along the waterways and embankments that will be rehabilitated under Component 1.

Supporting components include Component 5 (sanitation revolving fund) and Component 6 (Capacity Building and Implementation Support).

Phase 2 (scheduled from 2008 to 2013): In addition to continuation of the Phase 1, the proposed Phase 2 investments will include construction of the wastewater treatment plant (WWTP) for the city.

## 3. Summary of Existing Environmental and Socio-economic Conditions

Based on available reports of the Quang Binh DONRE, current air and water quality in the city's urban environment generally meet national standards. A noted exception is the apparently increasing levels of coliform bacteria to levels which are generally above national standards. According to 300 respondents to the socio-economic survey conducted as part of the EA, the most serious environmental issue in their area was the lack of sewage and drainage system and the second most serious issue was flooding. Illnesses related to poor environmental sanitation conditions, such as diarrhea and dysentery, are common and apparently increasing in frequency. In the household survey, 60 % of respondents reported that household members had been sick during the previous month from an environment-related illness.

According to the local authorities, the Loc Ninh dumpsite located about 8 km from the City center has been listed by the government as being in serious violation of environmental regulations and is planned to be closed. This dumpsite covers some 13 ha and has been operational since 1995. The wastes deposited at this dumpsite are not levelled or well covered, and generated leachate is not properly collected and treated. As a result, the leachate flows directly to nearby surface and ground waters, polluting these water sources. Groundwater from a tested well showed a serious level of pollution that is attributed to these uncontrolled and untreated leachate discharges. Based on the results of a Due Diligence Review conducted as part of the EA process, the on-going Dong Hoi Urban Development Project (DUDP) will not have adequate budget remaining to fund the proper closure of Loc Ninh dumpsite contrary to previous expectations.

#### 4. FORECAST AND ASSESSMENT OF PREDICTED ENVIRONMENTAL IMPACTS

##### 4.1. Summary of Predicted Impacts

Based on completed studies and local consultations, the sub-project is expected to have significant positive benefits for the environment, public health and the tourism-based economy due to reduced frequency and level of flooding in the City's urban center, improved collection and handling of liquid and solid wastes, and supportive improvements in sanitation service and capacity. Five (5) key sources of potentially adverse environmental impacts were identified during the EA study:

- (1) Impact of the construction work;
- (2) Discharge of untreated wastewater effluents from 3 outlets at the Nhat Le and Cau Rao Rivers and the Phong Thuy Channel
- (3) Transport and disposal of dredged sediment
- (4) Impacts of mine and unexploded ordinance removal
- (5) Potential cultural impacts to the 200 year old Binh Quan Citadel
- (6) Impact of Retaining Septic Tanks

##### 4.2 Impacts of Construction Work

The construction works for upgrading drainage and combined sewer systems will involve two catchment areas of Dong Hoi City. Potential sources of environmental impact will include some 3.08 km street excavations and an estimated 13,270 m<sup>3</sup> of excavated soil. These excavated materials will consist largely of sand which will be directly re-used on-site for back-filling excavated pipeline trenches once installation has been completed. The draft EA also provides an assessment and mitigation measures for the following common types of construction impacts:

- Dust, noise and air pollution from excavations, levelling and construction vehicles
- Domestic wastes generated during construction
- Leakage of residual grease and oil
- Impacts to traffic

##### 4.3 Discharge of Untreated Wastewater Effluents from New Household Connections

The untreated wastewater discharges of new household connections made to the combined sewer systems before WWTP are completed in Phase 2 would increase pollution loads and concentrations in the receiving water bodies. Based on the Construction Investment Project (CIP), 85% of the households in the wards of Dong My and Hai Dinh are expected to be connected during Phase 1, or a total of some 1,258 households (estimated 5,032 people). This compares to some 2,128 people (about 532 households) that are reportedly connected now.

The four (4) combined sewer outlet areas that would be directly impacted in the Dong My Ward are

Catchments	Discharge Outlet
------------	------------------

Phan Boi Chau street	Phong Thuy Channel
Nguyen Du street:	Nhat Le River (3 outlets - Le Qui Don, Han Mac Tu & Ba Huyen Thanh Quan)

The five (5) combined sewer outlet areas that would be directly impacted in the Hai Dinh Ward are

Catchments	Drainage Outlet
DONRE	Hao Thanh

Hung Vuong	Hao Thanh
Nguyen Trai Street	Nhat Le River
Nguyen Viet Xuan street	Nhat Le
Thach Han Street	Nhat Le

Based on the CIP for Phase 1, the domestic waste water from Dong Hoi City will be discharged through a series of nine (9) outlets, which are located close to each other along a short segment of Nhat Le River from the Cultural House in Dong My ward to the confluence of Nhat Le and Cau Rao Rivers (including the confluence area). This large estuary – river mouth area represents the receiving water body for the outlet discharges during Phase 1. It is necessary to note that this water body receives fresh water with high flow rate from upstream and also has high level of tidal exchange with the sea. Due to this high water exchange / flow rate and the close proximity of the nine outlets, the estimated pollution load and predicted change in pollution concentrations is calculated as a single value for the preliminary assessment (Tables ES - 1 and ES - 2).

Table ES – 1: Estimated Total Pollution Load of Nine (9) Combined Sewer Outlets

	No. of People Connected to the Outlet System	BOD (kg/day)	COD (kg/day)	SS (kg/day)	TN (kg/day)	P <sub>2</sub> O <sub>5</sub> (kg/day)	Coliform (million microbes/day) x 10 <sup>6</sup>
Option 1	2,128	63.86	104.44	104.44	14.9	3.62	532,175
Option 2: Proposed new phase 1 household connections	7,161	214.82	358.04	358.04	50.12	12.17	1,790,175
Increase with Phase 1 Connections	5,032	150.96	253.6	253.6	35.22	8.55	1,258,000

Table ES – 2: Predicted Change in Pollution Concentrations – Nhat Le River

LOCATION		Outlet 1, 6	Outlet 2, 3, 4, 5, 7, 8, 9
Receiving body		Phong Thuy Channel	Nhat Le River
BOD <sub>5</sub> (mg/l)	Baseline	13 (*) ( Sample taken during wet season)	21.1
	Phase 1	N/A	21.58 (**)
	% increase	N/A	2.27
	TCVN 5942 : 1995 (class B)	< 25	< 25
Coliform (MPN/ 100ml)	Baseline	7.2 x 10 <sup>4</sup> (*)	80.4 x 10 <sup>3</sup>
	Phase 1	N/A	80.68 x 10 <sup>3</sup> (**)
	% increase	N/A	0.35
	TCVN 5942 : 1995 (class B)	10 x 10 <sup>3</sup>	10 x 10 <sup>3</sup>

**Model:**

A model was done to predict the impact of adding an additional 1,258 households to the system before the wastewater treatment plant was constructed. The model makes certain assumptions. These assumptions and their limitations where the results are concerned are discussed in Section 6.2. Details of the model and results are in Annex 2.

These concentrations were used in a model to predict the pollution level near the outlets. There will be an increase but not significant compared to the existing pollution situation. The concentration of coliform, and COD near by the outlets in Nhat le River will be higher than allowed by national standards but these pollution concentrations are quickly reduced further from the outlets. Based on the above calculations, the predicted concentrations for coliform will meet national standard within 90 m downstream of the outlets. These predictions are based on the assumption that all discharges will be made from just one outlet (due to the close proximity of the 9 outlets). If we could calculate the discharge impact of each outlet, it is predicted that the pollution concentrations would be more dispersed and impacted areas (decay distances to meet national standards) may be closer to each outlet.

The sample taken from the site near by the outlet in Phong Thuy Chanel (see Station T1 in Annex 2.2) also showed that the COD and coliform parameters are much higher than allowed by national standards. The poor water quality of this constructed channel is visible with the black-gray color of wastewater near the outlets. Additional discharges to this Channel from Outlets 1 and 6 are not recommended due to the existing poor water quality in the channel and the significantly reduced dilution and dispersion capacity.

The most effective impact mitigation measure is to postpone the household connections until the WWTPs are operational or advance the schedule for constructing WWTPs to provide treatment earlier in the project period so that these project components are more closely linked. However, if it is agreed and locally approved to allow household connections to the combined sewer system prior to completion of the WWTPs, mitigation measures for "end of the pipe" treatments to reduce impacts and potential health risks are available and described.

#### 4.3.5 Impact from Septic Tanks

The question of whether to retain the septic tanks after the house connections are made is still unanswered. The prefeasibility study done by the National Consultant states that most of the septic tanks are either leaking or not functioning properly. If the septic tanks are retained then test should confirm that all are watertight and will remain so for the life of the project.

#### 4.4 Impacts of Excavation, Transport and Disposal of Dredged Sediments and Septage

Based on the sub-project CIP, the proposed areas and volumes of dredging activities are: Cau Rao River (138,800 m<sup>3</sup>), Phong Thuy Channel (23,900 m<sup>3</sup>), and Nam Ly Lake (20,598m<sup>3</sup>). Key impact concerns of these proposed activities include potential impacts to existing aquatic ecology, air quality and safety; transport, and disposal. Based on completed sediment testing results, the sediments to be dredged consist primarily of organic matter and can be used or disposed without special treatment. Expected uses of the dredge sediment include agricultural and landscaping uses. To improve handling and reduce volume and weight (by about 50%) of sediments needing to be transported, it is

recommended that "de-watering" and partial drying will be conducted along the river banks where dredging is conducted. It is estimated that a drying area 20 m by 1,770 m along Cau Rao River and 8 m by 1,000 m long along Phong Thuy Channel may be needed for this recommended sludge de-watering to be conducted during the dry season to be effective. Based on recent site surveys, open areas for such sludge drying are available near the dredging sites.

#### 4.5 Impact of Mine and Unexploded Ordinance Removal

The potential presence of unexploded mines and ordinance is a recognized impact issue in the Dong Hoi area. Local concerns for potential impacts to residents and work crews during construction included areas to be excavated under the city streets and areas to be dredged. Within the CIP cost estimates, budgets are provided for de-mining operations of proposed project sites. To minimize potential impacts, these activities will need to be well coordinated with concerned agencies and capable sub-contractors well in advance of proposed work schedules.

#### 4.6 Summary of Predicted Impacts on Natural Habitats (OP 4.04)

The proposed sub-project area primarily involves urban or sub-urban areas of Dong Hoi City. Non-urban lands in the area are widely used for farming and tree plantations. The nearby coastal areas largely consist of sandy beaches and offshore slopes. The natural lakes which are present in near the project area serve as part of the City's drainage and wastewater discharge system. Coral reefs and mangroves are not common in the coastal area. Quang Binh is located within the biological zone of north Truong Son which has a recognized high level of biodiversity and endemic species, particularly in the Karst Phong Nha- Ke Bang National Park, which is a UNESCO World Heritage Site. This unique national park is located some 30 – 50 km inland from Dong Hoi and the project investments are expected to benefit visitors to this protected area.

#### 4.7 Summary of Predicted Impacts on Cultural Resources (OP 4.11)

Based on site surveys and local consultations, the proposed sub-project sites do not include any known physical cultural resources, with the noted exception of the 200 year old Binh Dinh Citadel. Proposed drainage works in the Citadel area are located more than 150 meters away from this historic structure which is currently being renovated by the Department of Culture and Information, including similar types of drainage improvements to help protect this building from floods. The cultural history of the general area is significant. As result, special attention will need to be given during proposed excavation and dredging activities for possible discovery of cultural or historical artifacts. Provisions for reporting any discoveries during excavation or dredging works are provided in the proposed SOPs of the Contract Documents.

### 5.0 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

In accordance with the Bank's OP 4.01, the draft EA provides an environmental management plan (EMP) which is designed to: (a) Identify the set responses to potentially adverse impacts; (b) Determine requirements for ensuring that those responses are made effectively; and (c) Describe the means for meeting those requirements.

#### 5.1 Mitigation Measures

Based on the predicted Phase 1 environmental Impacts, appropriate mitigation measures are identified and described for each of the key project stages and types of impacts, including:

Mitigation Measures during Detailed Design, including general design considerations; design of drainage and sewerage systems; design of solid waste transfer stations:

Mitigation Measures during Construction, including specific mitigation measures during excavation and dredging activities;

Mitigation Measures During Operation, including drainage and sewerage systems, solid waste transfer station: environmental mitigation measures for resettlement sites

Septic tanks:

The majority of the septic tanks are either poorly designed, leaking, in need of major repairs or not functioning properly. If any is retained in service the long term integrity should be convincingly established by appropriate tests. This will be difficult, expensive and inconvenient. (Septic tanks are usually tested before placing in service). They will serve no useful purpose after the house connections are installed. They should be abandoned completely at the same time the house connections are made.



Table ES – 3 : Summary of environmental impacts and mitigations for temporary discharge – Dong Hoi city

Description of Outlet condition	Receiving body	Outlet 1, 6 Phong Thuy Channel	Outlet 2, 3, 4, 5, 7, 8, 9 Nhat Le River
	Hydraulic regime		- Hydrology of the channel is affected by the tide regime. - Max. depth: 3.2m
Purpose of water using		- Receive storm water for the North of city - Store water for irrigation in dry season	- Receive wastewater from combined system of the city.
Existing environmental issues		- The channel is already polluted by wastewater.	- The water of Nhat Le river near the existing outlets is slightly polluted.
BOD5 (mg/l)	Baseline	13 (*) ( Sample taken during wet season)	21.1
	Phase 1	N/A	21.58 (**)
	% increase	N/A	2.27
	TCVN 5942 : 1995 (class B)	< 25	< 25
Coliform (MPN/100ml)	Baseline	7.2 x 10 <sup>4</sup> (*)	80.4 x 10 <sup>3</sup>
	Phase 1	N/A	80.68 x 10 <sup>3</sup> (**)
	% increase	N/A	0.35
	TCVN 5942 : 1995 (class B)	10 x 10 <sup>3</sup>	10 x 10 <sup>3</sup>
Mixing zone (km)		N/A	90m downstream from outlet (in dry season)
Mitigation measures		- The Channel will be dredged in Phase I. - Remove accumulated garbage. - Promote community awareness campaign, in which people do not throw garbage to the channel. - Install coarse screen on the outlet, remove floating solids regularly and dredge sediment in the culvert and at outlet area.	- Install coarse screen on the outlet, remove floating solids regularly and dredge sediment in the culvert and at outlet area. - Signage of the potential risk for public health near the outlets.
Recommendation		- At present, the Channel is already polluted, further more, this channel is also used for irrigation. Farmers using the water for irrigation will be exposed to the polluted water and there is a high risk of contracting waterborne diseases.	The predicted BOD5 concentration in Nhat Le river is still below the national standard, however it might be slightly higher than predicted value for individual outlets. The concentration of coliform at present is many times higher than that of national standard and it is the risk for people who are living on the river and their livelihood depends on the river. Based on the results of the model analysis a limited amount of houses can be connected to these outlets.

Note: (\*) the sample taken at the downstream of confluent between Phong Thuy channel and Nhat Le River.

(\*\*) These predictions are based on the assumption that all discharges will be made from just one outlet (due to the close proximity of the 9 outlets)

## 5.2 Environmental Monitoring and Reporting

Environmental monitoring will be conducted at the following four (4) levels:

- Monitoring of project performance indicators;
- Monitoring of implementation of mitigation measures done by the Contractor;
- Community based monitoring; and
- Overall regulatory monitoring of the project.

A set of monitoring indicators is proposed to assess the implementation at various project stages. These performance monitoring indicators will be agreed in the final EA report, EMP and Project Implementation Plan (PIP) as well as the findings and recommendations of the Independent Safeguards Monitoring (ISM) Consultant to be appointed under the project. The PMU will prepare for the Bank bi-annual performance monitoring reports, which will detail project progress with respect to agreed targets for the environmental performance indicators.

## 5.3 Project Organization for Environmental Management System

The draft EA recommends an organizational and systematic approach towards an environmental management system involving the following key project stakeholders and responsibilities:

**Project Management Unit (PMU):** The PMU has the overall responsibility to implement and monitor the EMP. Assisted by the ISM and CMC consultants, the PMU will monitor and report on the implementation of mitigation measures during the contractor's construction works. The proposed PMU staffing organization will include at least one environmental mitigation and monitoring specialist.

**Community Representatives:** At the sub-project's tertiary and household connection levels, community representatives will be encouraged to monitor the environmental sanitation conditions in their areas.

**Construction Management Consultant (CMC):** The main tasks of CMC are monitoring basic construction practices and procedures, including Standard Operating Procedures (SOPs) for mitigating environmental impacts as described in the draft EA.

**Independent Safeguards Monitoring (ISM) Consultant:** The ISM will be responsible for monitoring EMP implementation activities and ensuring that agreed environmental and social safeguard policies of the GoV and the Bank are applied and monitored.

## 5.4 Capacity Development and Training

Needed training on how to implement effective environmental monitoring, mitigation and reporting measures and systems will be provided to key stakeholders (PMU, contractors and community representatives) based on the actual project needs, roles and responsibilities.

### 5.5 Budget Requirements for Environmental Management, Mitigation and Monitoring

A summary of the proposed budgets for recommended CCESP environmental management, mitigation and monitoring measures is presented in Table ES – 4.

**Table ES – 4: Estimated Budget Costs for EMP Implementation (in USD)**

	Description	Proposed Budget	Source of Budget
1	Implementation of Mitigation Measures	Costs included in construction contracts	Loan proceeds
2	Environmental Training of PMUs, communities etc.	17,000	Loan proceeds
3	Independent Safeguards Monitoring (ISM)	23,000	Loan proceeds
4	Environmental Monitoring by CMC	Costs included in Supervision Contract	Loan proceeds
5	EMP Administration & Management by PMU	Costs included in PMU operating costs	GoV counterpart
	<b>Total</b>	<b>40,000</b>	

*Note: Proposed budget costs exclude VAT, contingency and escalation costs.*

---

**TABLE OF CONTENTS**

<b>1</b>	<b>INTRODUCTION AND PROJECT DESCRIPTION.....</b>	<b>1.1</b>
1.1	BACKGROUND OF THE PROJECT.....	1.1
1.2	SUMMARY DESCRIPTION OF PHASE 2 OF THE PROPOSED SUB-PROJECT .....	1.6
1.3	IMPLEMENTATION SCHEDULE OF THE PROPOSED SUB-PROJECT .....	1.7
<b>2</b>	<b>ENVIRONMENTAL POLICIES AND LEGISLATION .....</b>	<b>2.1</b>
2.1	ENVIRONMENTAL MANAGEMENT .....	2.1
2.2	ENVIRONMENTAL LAWS AND STANDARDS RELATED TO THE PROJECT.....	2.1
2.3	WORLD BANK SAFEGUARD POLICIES TO BE ADDRESSED IN THE EA.....	2.1
<b>3</b>	<b>PROJECT BACKGROUND AND PLANNING FRAMEWORK .....</b>	<b>3.1</b>
3.1	SUMMARY OF THE SUB-PROJECT SETTING .....	3.1
3.2	SUMMARY OF CURRENT ENVIRONMENTAL SANITATION ISSUES AND CONSTRAINTS.....	3.1
3.3	PREVIOUS AND ON-GOING RELATED PROJECTS AND STUDIES.....	3.1
3.4	PROJECT RELATIONSHIP TO DEVELOPMENT MASTER PLANS AND FORECASTS .....	3.2
3.5	MASTER PLAN OBJECTIVES FOR ENVIRONMENTAL PROTECTION.....	3.2
<b>4</b>	<b>EXISTING ENVIRONMENTAL CONDITIONS AND BASELINE DATA.....</b>	<b>4.1</b>
4.1	CLIMATE CONDITIONS.....	4.1
4.2	TROPICAL STORMS AND TYPHOONS .....	4.1
4.3	TOPOGRAPHY AND SOIL CONDITIONS.....	4.2
4.4	FLORA, FAUNA AND NATURAL HABITATS .....	4.2
4.5	SEA AND RIVER CONDITIONS .....	4.5
4.6	POPULATION AND SOCIO-ECONOMIC ENVIRONMENT .....	4.7
4.7	STATUS OF ENVIRONMENTAL SANITATION IN THE SUB-PROJECT AREA .....	4.10
<b>5</b>	<b>ALTERNATIVES OF THE PROJECT.....</b>	<b>5.1</b>
5.1	WITHOUT THE PROJECT SITUATION.....	5.1
5.2	DRAINAGE, FLOOD CONTROL AND WASTEWATER COLLECTION ALTERNATIVES .....	5.1
5.3	RESETTLEMENT ALTERNATIVES .....	5.4
<b>6</b>	<b>ENVIRONMENTAL IMPACT ASSESSMENT.....</b>	<b>6.1</b>
6.1	IMPACTS OF CONSTRUCTION WORK.....	6.1
6.2	DISCHARGE OF UNTREATED WASTEWATER EFFLUENTS FROM NEW HOUSEHOLD CONNECTIONS .....	6.5
6.3	EXCAVATION, TRANSPORT AND DISPOSAL OF DREDGED SEDIMENTS AND SEPTAGE .....	6.12
6.4	IMPACT OF MINE AND UNEXPLODED ORDINANCE REMOVAL .....	6.14
6.5	POTENTIAL CULTURAL IMPACTS TO THE BINH DINH CITEDAL .....	6.14
6.6	IMPACTS IDENTIFIED DURING PUBLIC CONSULTATIONS.....	6.15
<b>7</b>	<b>MITIGATING MEASURES.....</b>	<b>7.1</b>
7.1	INTRODUCTION.....	7.1

7.2	MITIGATION MEASURES DURING DETAILED DESIGN.....	7.1
7.3	MITIGATION MEASURES DURING CONSTRUCTION.....	7.2
7.4	MITIGATION MEASURES DURING OPERATION.....	7.8
8	MONITORING AND REPORTING.....	8.1
8.1	PROJECT PERFORMANCE INDICATORS.....	8.1
8.2	MONITORING IMPLEMENTATION OF MITIGATION MEASURES.....	8.1
8.3	COMMUNITY BASED MONITORING.....	8.2
8.4	OVERALL REGULATORY MONITORING.....	8.2
8.5	SUMMARY OF PROPOSED ENVIRONMENTAL MONITORING MEASURES.....	8.2
9	PROJECT ORGANIZATION FOR ENVIRONMENTAL MANAGEMENT AND MONITORING... ..	9.1
9.1	PROJECT MANAGEMENT UNIT (PMU).....	9.1
9.2	COMMUNITY REPRESENTATIVES.....	9.2
9.3	CONSTRUCTION MANAGEMENT CONSULTANT (CMC).....	9.2
9.4	INDEPENDENT SAFEGUARDS MONITORING (ISM) CONSULTANT.....	9.3
10	CAPACITY DEVELOPMENT AND TRAINING.....	10.1
10.1	ENVIRONMENTAL TRAINING.....	10.1
11	BUDGET REQUIREMENTS FOR ENVIRONMENTAL MANAGEMENT, MITIGATION AND MONITORING.....	11.1

## LIST OF FIGURES

PART I

Figure I – 1.1	Location Map of Cities with CCESP Project .....	1.2
Figure I – 1.2	Locations of Components under Dong Hoi Sub-Project, CCESP .....	1.5
Figure I – 1.3	Implementation Schedule and Key Environmental Safeguard Activities .....	1.7
Figure I – 4.1	Meteorology in Dong Hoi (1978-1997) .....	4.1
Figure I – 4.2	Map of Locations for DONRE Water Sampling and Testing in Dong Hoi City .....	4.6
Figure I – 4.3	Location Map of Common Flooded Areas of Dong Hoi City .....	4.12
Figure I – 6.1	Location Map of Discharge Outlets for Proposed New Household Connections...	6.7
Figure I – 6.2	Predicted Change in Coliform Concentrations with Downstream Distance from Outlet	6.11
Figure I – 6.3	Predicted Change in BOD <sub>5</sub> Concentrations with Downstream Distance from Outlet Error! Bookmark not defined.	
Figure I – 6.4	Location Map of Binh Quan Citadel and Proposed Phase 1 Activities .....	6.15
Figure II – 9.1	Project Organizational Structure for Environmental Management .....	9.1

## LIST OF TABLES

## PART I

Table I - 1.1:	Phase 1 Sub-project Components for Environmental Assessment, Dong Hoi.....	1.4
Table I - 3.1:	Summary of the Provincial and City Development Plans for Dong Hoi.....	3.2
Table I - 4.1:	Monthly Average Wind Velocity (in m / second) and Direction: Dong Hoi.....	4.1
Table I - 4.2:	Summary of Water Quality Monitoring Results of the Dong Hoi DONRE:.....	4.7
Table I - 4.3:	<b>Percent (%) of Samples conducted by CCESPEA in December 2005 – January 2006 which Exceeded National Water Quality Standards</b> .....	4.7
Table I - 4.4:	Population and density in 2003 (source: Statistical Yearbook 2003).....	4.7
Table I - 4.5:	Socio-Economic Classification of Households based on Surveys and Group Discussions (income values in VND) .....	4.9
Table I - 4.6:	Economic Structure of Quang Binh Province.....	4.10
Table I - 4.7:	Number of Tourists and Tourism Revenue, Quang Binh Province (2001 – 2004).....	4.10
Table I - 4.8:	Summary Composition of Urban Solid Waste, Dong Hoi .....	4.13
Table I - 4.9:	Quality of Tested Leachate from Loc Ninh Dumpsite, Dong Hoi City.....	4.14
Table I - 5.1:	Summary of Advantages and Disadvantages of Household Connection Options .	5.3
Table I - 6.1	Summary of Proposed Excavations for Upgrading Drainage and Sewer Systems.	6.2
Table I - 6.2	Dust and Air Pollution Coefficient of Construction Vehicles (in kg / u) .....	6.3
Table I - 6.3	Predicted Dust and Air Pollution Load Generated from Construction Vehicles (kg/day) .....	6.3
Table I - 6.4	Predicted Noise Levels from Construction Vehicles and Equipment.....	6.3
Table I - 6.5	Estimated Increase in Total Pollutant Load with Proposed Phase 1 Household Connections – All Discharge Outlets .....	6.8
Table I - 6.6	Predicted Changes of Pollution Concentration in the Nhat Le River after Phase 16.	10
Table I - 6.7	Summary of CCESP Sediment Quality Sampling Results: Dong Hoi Subproject	6.13
Table II - 7.1	General Environmental Mitigation Measures during Construction .....	7.3
Table II - 8.1	Summary of Proposed Environmental Measures and Parameters.....	8.2
Table II - 10.1	Environmental Training Program .....	10.1
Table II - 11.1	Estimated Budget Costs for EMP Implementation (in USD) .....	11.1

List of Annexes

Annex 1 : List of EA Preparers and References

Annex 2 : Baseline Data and Hydraulic Modelling Results

Annex 2.1: Air and Water Quality Baseline Data for Quy Nhon (2002 – 2005), Binh Dinh  
DONRE

Annex 2.2: Copies of CCESP Water Quality Testing Results

Annex 2.3: Summary Results of CCESP Hydraulic Modelling

Annex 2.4: Copies of CCESP Sediment Quality Testing Results

Annex 2.5: Copies of CCESP Geotechnical Investigation Results – Luong Hoa Landfill Site

Annex 3 : Public Consultation and Disclosure

Annex 3.1: Summary Results from the Socio-Economic Survey and Household Consultations

Annex 3.2: Summary of Socio-Economic Survey and Household Consultations (Sept. – Oct.  
2005)

Annex 3.3: List of Participants and Minutes of 2<sup>nd</sup> Public Consultation in Quy Nhon for EA

Annex 3.4: Survey Results for Project Affected People (PAPs) near Phase 1 Discharge  
Outlets

Annex 3.5 PPU Disclosure Letter for Quy Nhon Draft EA

Annex 4 : Recommended SOPs for Environmental Management during Construction



## LIST OF ABBREVIATIONS

## ORGANIZATIONS

CCESP	Coastal Cities Environmental Sanitation Project
CPC	City People's Committee
CWU	City Women's Union
DONRE	Department of Natural Resources and Environment
DUDP	Dong Hoi Urban Development Project
IMAS	International Mine Action Standards
MOC	Ministry of Construction
MONRE	Ministry of Natural Resources and Environment
MOSTE	Ministry of Science, Technology and Environment
NGO	Non Governmental Organization
PMU	Project Management Unit
PPC	Provincial People's Committee
PPU	Project Preparation Unit
PWU	Provincial Women's Union
UWC	Urban Works Company
SDC	Swiss Development Cooperation
VWU or WU	Vietnamese Women's Union
WB, the Bank	The World Bank
WHO	World Health Organization
WSSC	Water supply and sewerage company
YU	Youth Union

## OTHERS

BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
EA	Environmental Assessment
EMP	Environmental Management Plan
CIP	Feasibility Study
GOV	Government of Vietnam
HDPE	High Density Polyethylene
HH	Households
PIP	Project Implementation Plan
Pre-FS	Pre Feasibility Study
RAP	Resettlement Action Plan
SS	Suspended Solids
TOR	Terms of Reference
WWTP	Waste water treatment plant
UNITS	
USD or US\$	United States Dollar
VND	Vietnamese Dong
M	Meters
Cm	Centimeters

---

Mm	Millimeters
Km	Kilometers
L	Liter
M <sup>3</sup>	cubic meters
T	Ton
Kg	Kilogram
Ha	Hectare

---

**GLOSSARY**

<b>Combined Sewers</b>	Pipes, drains or culverts that carry both rain water and wastewater which in dry weather only carry wastewater. During heavy rain, they carry a highly diluted mixture of rain water and wastewater.
<b>Dumpsite</b>	A site used to dispose of solid waste without any management and/or environmental controls.
<b>Healthcare Waste</b>	Includes all waste generated by healthcare institutions, research facilities and laboratories.
<b>Incineration</b>	Thermal processing or combustion of waste in a controlled environment used primarily for volume reduction.
<b>Interceptor Sewers</b>	Interceptor sewers are used in conjunction with combined sewer systems to intercept wastewater prior to discharge into lakes, rivers or the ocean (where it would cause pollution.) In dry weather, interceptor sewers transfer all wastewater from combined sewer systems. In wet weather, the highly diluted wastewater discharges to the lakes, etc.
<b>Leachate</b>	Contaminated water which has percolated through waste and typically contains dissolved or suspended solids and/or liquids.
<b>Sanitary Landfill</b>	Properly sited, designed and operated method of disposing waste to land in a manner that protects the environment and public health.
<b>Separate Sewers</b>	Separate systems of sewers have two different pipes that are not inter-connected; one for rain water and a separate one for wastewater.
<b>Septage</b>	Sludge that accumulates within septic tanks and must be periodically removed for disposal.
<b>Transfer Station</b>	Facility at which waste collected by small vehicles and push carts is transferred to larger vehicles for economical haulage to treatment / disposal facilities.
<b>Waste Water Treatment Plant</b>	Facility at which wastewater is collected and treated to reduce the amount of pollutants in wastewater.

## Part

## 1

## ENVIRONMENTAL ASSESSMENT

## 1 INTRODUCTION AND PROJECT DESCRIPTION

## 1.1 Background of the Project

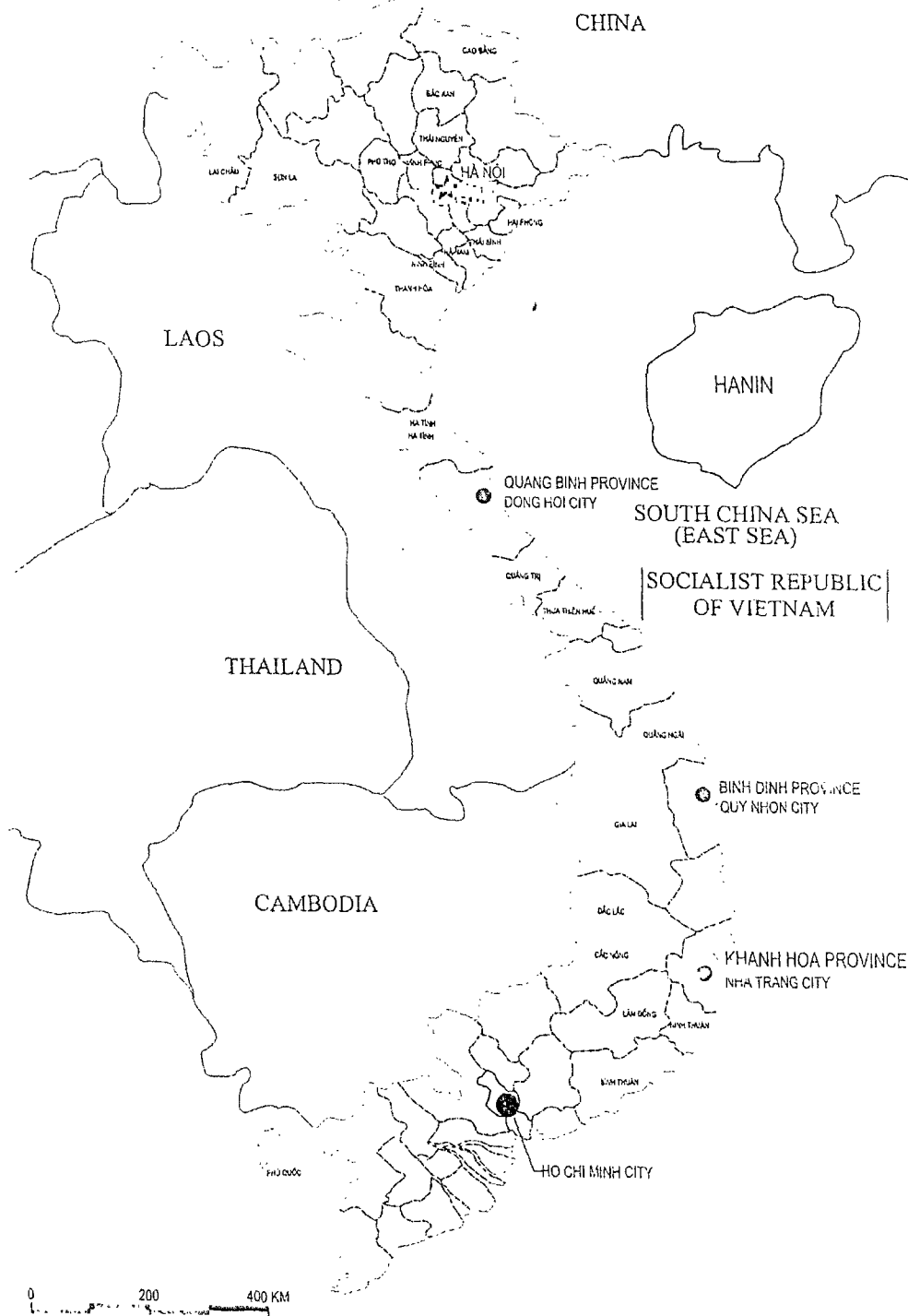
Consistent with the Government of Vietnam's (GoV) strategy of developing the sanitation and drainage components of its' urban infrastructure during the period of 2001 – 2010, the proposed Coastal Cities Environmental and Sanitation Project (CCESP) represents the next tier of smaller coastal cities with high tourism potential in which the World Bank has been invited to invest in environmental sanitation. The CCESP builds on recent and on-going projects of the Bank's urban sector portfolio in Vietnam, including the on-going Three Cities Sanitation Project (Loan No. 3211 – VN) and previously completed Ho Chi Minh City Sanitation Project and Urban Upgrading Project.

As an initial step to help improve sanitation and control pollution in smaller coastal cities, the GoV selected the three cities of Nha Trang (Khanh Hoa Province), Quy Nhon (Binh Dinh Province) and Dong Hoi (Quang Binh Province) to participate in the proposed CCESP, the general locations of which are shown in Figure I – 1.1. These three cities of central Vietnam were selected because they are currently experiencing higher than average rates of population growth and economic development, and a recognized need for environmental sanitation investments that are beyond the present resources of the national and local governments to address in the near future.

Within the three targeted urban areas, the primary environmental sanitation objectives of the CCESP project are to help:

- Reduce the incidence of flooding;
- Separate wastewater and storm drainage collection systems,
- Construct new wastewater collection, pumping and treatment system and facilities;
- Improve the collection and ensuring the safe disposal of solid waste;
- Establish new and better designed landfill sites
- Strengthen the capacity of the urban environmental companies (URENCO) in each of the three cities to sustain the improvements made.

Figure I – 1.1 Location Map of Cities with CCESP Project



Meeting these objectives is expected to result in improved public health, especially for poor residents in the project cities, reversed environmental degradation and improved functioning of sanitation infrastructure and lead to higher efficiency and economic growth potential, particularly from tourism. To meet these objectives, the CCESP will support six (6) components, namely:

- Component 1: Drainage and wastewater
- Component 2: Wastewater treatment
- Component 3: Solid waste management
- Component 4: Resettlement
- Component 5: Sanitation revolving fund
- Component 6: Capacity building and implementation support

In May 2005, a consultancy contract was signed with the Vietnamese National Consultants – Vietnam Water Supply and Sewerage Consultant Company (VIWASE) for a part of Phase 1 work and on August 2, 2005, a similar contract was signed with The Louis Berger Group - The Nippon Koei (LBG-NK) association to do other work related to Phase 1 preparation. Prior to this, separate specialist studies in solid waste and wastewater treatment options were funded by Dutch government, World Bank and US Agency for International Development (USAID) to investigate treatment and disposal choices and to advise the National Consultant before and during the preparation of the Pre-FS, which was completed in February 2005. More recently, the World Bank (WB), on behalf of the Government of Vietnam (GOV), secured Japanese grant funding (PHRD Grant) to support preparation of the two CCESP phases.

**Purpose and Objective of the Environmental Assessment (EA):** This EA has been designed to meet the concurrent requirements of the World Bank, the GoV and the Province of Quang Binh to properly assess potential environmental impacts as a basic part of the project preparation cycle and to provide specific guidance on measures needed to mitigate, manage and monitor potential environmental impacts during project implementation and operation. In addition to avoiding or minimizing impacts from the planning stage, the objective of the EA study and document is to help improve overall performance and benefits of the project if it is implemented. In general, social impacts are separately addressed and assessed in specific cases where Resettlement Action Plans (RAPs) are required.

#### Summary Description of Phase 1 of the Proposed Sub-Project

In summary, the objectives of the Dong Hoi City Sub-project, Phase 1 are to:

- Mitigate flooding and improve environment in the City center;
- Initiate a revolving fund for the improvement of household sanitation; and
- Strengthen the capability of the Project Management Unit (PMU).

As detailed in Table 1 – 1.1, proposed Phase 1 component activities include:

- Rehabilitation of existing combined sewers in the three (3) inner wards of Dong My, Dong Phu and Hai Dinh;
- Construction of new combined sewers in other areas;

- Dredging and protection of banks of key channels, i.e., Cau Rao River and Phong Thuy Canal;
- Setting up of a pilot revolving fund for improvement of household sanitation; and
- Institutional strengthening and capacity building of the CCESP Project Management Units (PMU).

The proposed CCESP project components included in Phase 1 are as follows:

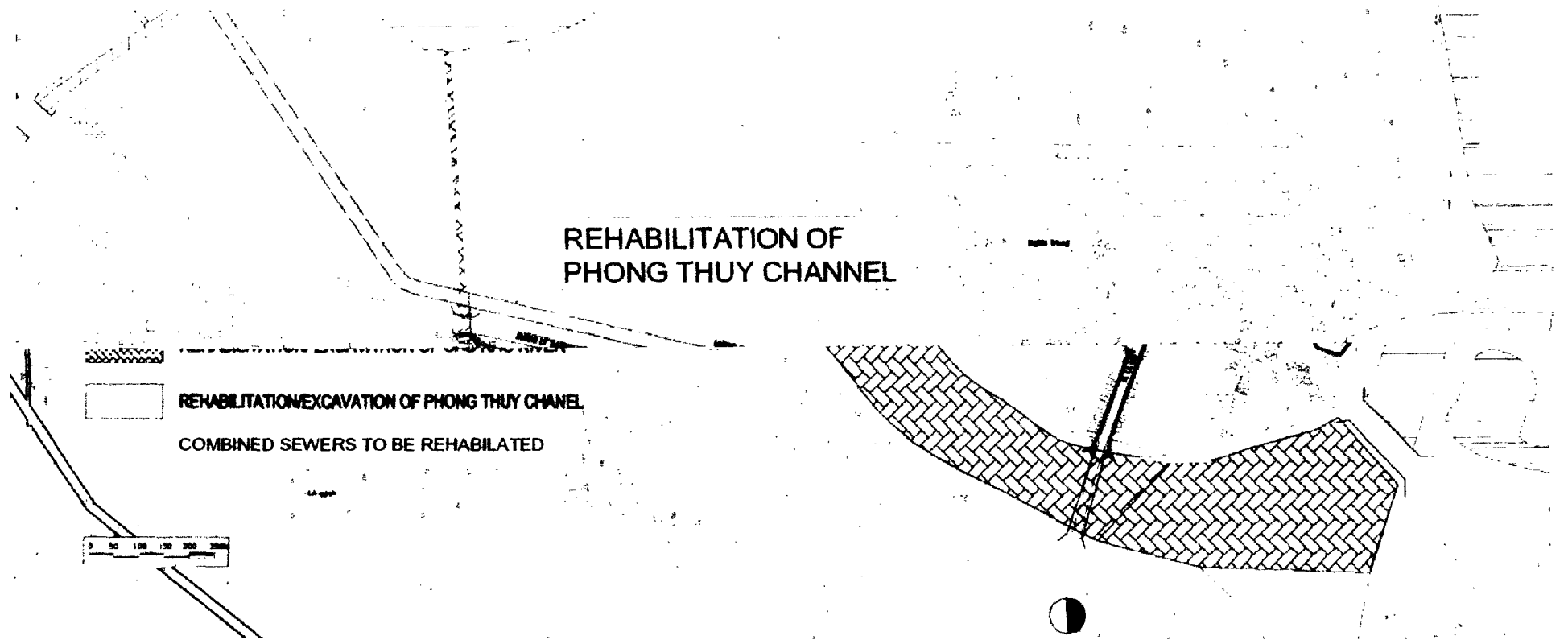
- Component 1: Drainage, Flood Control and Wastewater Collection
- Component 5: Sanitation Revolving Fund
- Component 6: Capacity Building and Implementation Support

Component 2 (Wastewater Treatment), Component 3 (Solid Waste Management) and Component 4 (Resettlement) activities are not proposed in Dong Hoi during Phase 1, so these subjects will only be included in the Phase 1 assessment. Figure I - 1.2 provides a general project location map of these proposed Phase 1 component activities, which are summarized in the following sections.

Table I - 1.1: Phase 1 Sub-project Components for Environmental Assessment, Dong Hoi

Subproject Component	Specific Objective
<b>A. Drainage, Flood Control &amp; Wastewater Collection</b>	
A.1 Rehabilitation of existing pipes, 6,000 m	To rehabilitate natural drainage channels and existing urban drainage systems in the City center to make sure City center has sufficient drainage capability and flood control / protection.
A.2 Rehabilitation and replacement of 600 manholes and covers	
A.3 Replacement of, and new, drains, 26,110 m; manholes, 180 units; inlets, 180 units; flap gates, 5 units; and some flood control arrangements in Donh Phu Ward.	
A.4 Rehabilitation of Cau Rao River Dredging, 138,000 cu m; improve 4.0 km of embankment	
A.5 Rehabilitation of Phong Thuy Channel Dredging, 23900 cu m; improve 5.0 km of embankment	
A.6 Rehabilitation of Nam Ly Pond Dredging , 20,598 cu m; improve 0.8 km of embankment	
A.7 Rehabilitation of Muoi Culvert	
A.8 Diversion of wastewater discharge to the moat	
A.9 Street surface and pavement improvement, 25,000 sq m	
<b>B. Resettlement</b>	To compensate 47 households affected by the rehabilitation of the Cau Rao River & Phuong Thuy Channel
<input type="checkbox"/> Components with resettlement impacts	

Figure I - 1.2 Locations of Components under Dong Hoi Sub-Project, CCESP





*Component 1: Drainage, Flood Control and Wastewater Collection*

During Phase 1, existing "combined" sewer systems will be either rehabilitated or replaced and expanded, involving a total length of 22 km to be rehabilitated, dredged and installed, a total of some 3.8 km of drainage channels will be dredged and embankments improved. Existing outfalls that are subject to tidal influence will have flap valves installed.

*Component 2: Wastewater Treatment*

No Phase 1 activities are proposed except for completing the land acquisition and related resettlement activities for the agreed site(s).

*Component 3: Solid Waste Management*

Dong Hoi is benefiting from the Dong Hoi Urban Development Project (DUDP) being funded by Swiss Government. A new landfill in Ly Trach shall be provided under this project, with the capacity to meet the projected solid waste disposal needs of Dong Hoi City and Bo Trach district for 25 years. This proposed Ly Trach landfill project, with an estimated investment cost of 20.6 billion VND (about US\$ 1.3 million) was approved by the Provincial People's Committee (PPC) in March 2005. There are no solid waste treatment facilities proposed for Phase 1 implementation under the CCESP.

*Component 4: Resettlement*

In Phase 1, the resettlement activities will involve project affected people (PAPs) from the rehabilitation of the Phong Thuy Channel and Cau Rao River. The total of aquaculture (fishpond) and residential land areas to be acquired are 77,382 m<sup>2</sup> and 1,265 m<sup>2</sup>, respectively, involving a total of 47 households. The local People's Committee has approved the resettlement of these PAPs at an area located at the extension of the Tran Quang Khai Street at Dong Phu Ward

*Component 5: Sanitation Revolving Fund*

This proposed Fund is designed to assist poorer households to avail of small loans to enable them to properly construct or rehabilitate their toilet, septic tank and/or connect to new sewer lines.

*Component 6: Capacity Building and Implementation Support*

Proposed Phase 1 activities will include the following:

Capacity Building:: Training workshops and capacity building programs; Geographic Information System (GIS) and Management Information System (MIS); Technical assistance (TA) support for household sanitation, and TA for private sector participation (PSP).

Implementation Support: TA for PMU project management; Preparation of Phase 2 studies and documents; Construction supervision of Phase 1 sub-project; Vehicles and equipment for PMU; Administration and project manager for PMU; Auditing, and EA and RAP monitoring.

## 1.2 Summary Description of Phase 2 of the Proposed Sub-Project

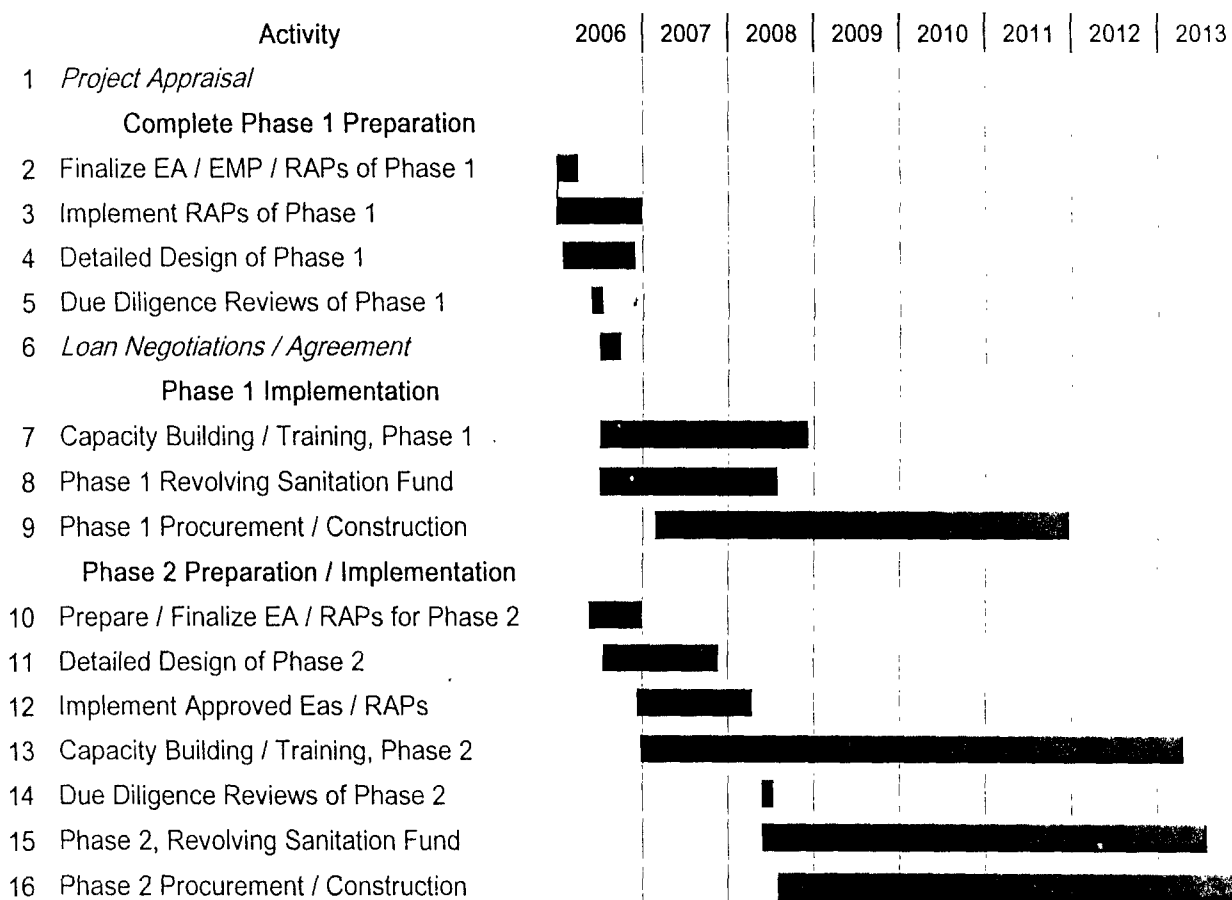
In addition to continuing the above listed component investments, proposed Phase 2 activities in Dong Hoi will include construction of the wastewater treatment plant (WWTP) and support to solid

waste management among other activities. The EA for Phase 2 will be prepared according to Environmental Guidelines which will be submitted together with this report.

1.3 Implementation Schedule of the Proposed Sub-Project

A summary of the proposed CCESP implementation schedule is provided in Figure 1 – 1.3 which has been simplified to focus on project activities which are of most concern to this EA.

Figure 1 – 1.3 Implementation Schedule and Key Environmental Safeguard Activities



## 2 ENVIRONMENTAL POLICIES AND LEGISLATION

### 2.1 Environmental Management

At the national level, environmental management in Vietnam is lead by its Ministry for Natural Resources and Environment (MONRE) with the following key tasks and powers:

- Direct and supervise the implementation of environmental protection regulations, programs and projects as assigned by the government
- Establish and uniformly manage the national environmental monitoring system; summarize and process data from environmental monitoring and regularly assess the environment to forecast the environmental changes
- Appraise EA reports submitted for proposed projects; regulate environmental standards and manage the licensing, standards and certification systems in accordance with current laws;

On the provincial level, the Department of Natural Resources and Environment (DONRE) is the legal body with responsibility for environmental regulation. DONRE has the overall responsibility that the Vietnamese environmental regulations are followed during project construction and operation.

### 2.2 Environmental Laws and Standards related to the Project

A summary of key national laws governing environmental management of concern to the project include but are not limited to the following:

- National Law on Environmental Protection (December 27, 1993).
- Decree No. 175-CP (Oct. 18, 1994) on implementation of the Law on Environmental Protection.
- Decree No. 143/2004/ND-CP on amendment of article 14 of Decree No. 175/CP.
- Decree No. 91/2002 (Nov. 11, 2002) on the Mandate, Organization and Functions of MONRE.
- Decision No. 45/QD-TTg (April. 2, 2003) on establishing provincial Department of Natural Resources and Environment (DONRE).
- Inter-Ministry Instruction on Regulation of Environmental Protection for Solid Waste Disposal Areas (No. 01 / 2001 / TTLT – BKHCNMT – BXD).
- Circular 490/1998/TT-BKHCNMT on guidelines for the preparation and appraisalment of environmental impact assessment (EIA).
- Decision No. 155/1999/QD-TTg (July 16, 1999) on hazardous solid waste management.
- MONRE Decision No. 35 / 2002 / QD-BKHCNMT on standards to be applied during the preparation of an Environmental Assessment (EA):

### 2.3 World Bank Safeguard Policies to be Addressed in the EA

In additional to environmental review and approval procedures of the Government of Vietnam, the CCESP must be prepared and implemented in accordance with the World Bank's environmental and social "safeguard" policies. Based on these safeguard policies, the CCESP was classified by the Bank at its conceptual stage of preparation as a Category A type project. A proposed project is classified as "A" if it is likely to have significant adverse environmental impacts that are sensitive, diverse or unprecedented. These impacts may include an area far wider than the physical works. An EA for a Category A project examines the projects potential negative and positive environmental impacts,

compares them with those of feasible alternatives (including the do nothing option) and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

Based on a review of the sub-project area and proposed activities, application of the following World Bank environmental and social safeguard policies were assessed during the EA process:

- Environmental Assessment – Operational Procedural / Bank Procedure 4.01 (OP/BP 4.01):
- Natural Habitats (OP 4.04)
- Cultural Resources (draft OP 4.11 - OPN 11.03)

**Stakeholder Consultations:** As a Category A project, two stages of consultations will be conducted and documented in accordance with the Bank's Operational Procedure (OP) 4.01. The first stage was conducted during the September / October 2005 collection of environmental and socio-economic data, involving surveys of some 300 households. A second stage of stakeholder consultations on the draft EA was held on December 27, 2006 and involved 20 participants. This second stage of consultations was supplemented by a written questionnaire survey conducted in mid-February 2006 for stakeholders residing near proposed discharge outlets. Documentation on these consultations is provided in Annex 3.

**Public Disclosure:** As a Category A project, completed EAs must be available made to the public in accordance with Bank Procedure (BP) 17.50. The draft EA was disclosed in Washington DC and the Vietnam Development Information Center (VIDC) in Hanoi by January 19, 2006. The Vietnamese translations of Executive Summary were disclosed by January 13, 2006. All documents were disclosed locally by the Provincial People's Committee (PPC), the provincial Department of Natural Resources and Environment (DONRE), the Project Preparation Units (PPUs), offices of the Wards in which people will be affected, and were accessible in a form, manner, and language intelligible to local non-government organizations (NGOs) and project affected people (PAPs). Documentation of this public disclosure is also provided in Annex 3.

### 3 PROJECT BACKGROUND AND PLANNING FRAMEWORK

#### 3.1 Summary of the Sub-Project Setting

Dong Hoi City is a coastal city in central north of Vietnam, located 490 km south of Hanoi and 160 km north from Hue, and is the center of administration, economy, culture, science and transportation of Quang Binh Province. It is an attraction to tourists due to its famous historical sites, culture, attractive beaches and the Phong Nha - Ke Bang National Park, which is recognized as a World Natural Heritage Site by the United Nations Educational, Scientific and Cultural Organization (UNESCO).

Dong Hoi City has a total land area of 155.5 square kilometers, administratively subdivided into 10 wards and 6 communes. As of 2003, the City registered a total population of nearly 99,197 people, of which over 58,000 (or 60%) reside in the urban area (10 wards). In recent years, the economy of Dong Hoi has been developing at a high rate with its industry (manufacturing, construction and tourism) and service sectors increasingly contributing to overall gross domestic product (GDP).

#### 3.2 Summary of Current Environmental Sanitation Issues and Constraints

Current issues and constraints from lack of environmental sanitation and related infrastructure include:

- The urban drainage system, which basically consists of the combined sewer type, was built over the past two decades and has undergone a series of small renovations and upgrading. It is currently in a deteriorated state, and rapid urban growth, coupled with inadequate maintenance, has rendered its drainage capability inadequate. The existing drainage system is located mainly in two (2) urban wards, Hai Dinh and Dong My. During the rainy season, the City's central areas are regularly flooded.
- The City's natural drainage system relies mainly on the Cau Rao River and Phong Thuy Channel, the downstream drainage flow of which has been drastically reduced by aquaculture activities, vegetative overgrowth and settlers along riverbanks. These natural drainage flows are also constricted by several under-designed road crossings, which often are blocked by debris during flood periods.
- Not all of the generated domestic and industrial wastewater is pre-treated in septic tanks prior to discharge to the environment. Some wastes are collected through the existing combined sewers. In highly populous areas, infiltration latrines are still used, creating risks to ground water quality.
- Wastewater from the largest hospital in Dong Hoi (the Vietnam - Cuba Hospital) merely passes through a simple small-scale aeration pond prior to discharge to the environment, while wastes from small businesses, restaurants and hotels are coursed through local septic tanks or settling tanks prior to discharge to the drainage system.
- Only 50% of solid waste generated in the urban area is reported collected. In some suburban areas, collection is performed only in central markets. Collected solid wastes are disposed of openly in the City dumpsite, some 8 km from the City center.

#### 3.3 Previous and On-going Related Projects and Studies

To help address these environmental sanitation issues and constraints, various project-related studies and programs have been conducted or are on-going, including:

- Adjustment of the development master plan of Dong Hoi, prepared by Urban Planning Institute in 2000, and approved by Quang Binh Provincial People's Committee (PPC) in 2001.
- Construction Investment Project (CIP) on drainage and wastewater collection and treatment project for Dong Hoi, prepared by the Viet Nam Industrial Construction Consultant in March 2003
- CIP and preliminary design for shared land fill in Ly Trach, carried out by DUDP in 2002.
- Restructuring of the organization of Quang Binh Urban Work Company proposed by DUDP in 2001.
- Dong Hoi development master plan 1999 – 2020 prepared by National Urban Planning Institute, Ministry of Construction (MOC) in 2000 and approved by Quang Binh PPC in 2001.
- Bao Ninh peninsula development master plan, prepared by Dong Hoi Planning Center and approved by the Quang Binh PPC in 2004

### 3.4 Project Relationship to Development Master Plans and Forecasts

The proposed CCESP sub-project investments in Dong Hoi will comply with and support the development framework and master plans of the City of Dong Hoi, key points of which are summarized in Table I-3.1.

Table I - 3.1: Summary of the Provincial and City Development Plans for Dong Hoi

**Spatial development:** According to spatial development orientation, the city will mainly be developed to the north (forward to Ly Trach commune, Bo Trach district), some part in the south and west. Urban area shall develop under Corridor shaped in combination with Multi Centric, base on topographical of the city and sustainable development. Bao Ninh is planned to be for commercial and tourist development area with specific master plan.

**Population forecast:** According to the plans, the City's urban population will be about 184,900 by 2020, in which the urban population is 122,700 and this number in suburban area is 62,200

**Water supply system** will continue to expand with a 2020 targeted domestic water supply of 130 liters / person / day and a population coverage of 90%.

**Wastewater drainage plan:** By 2020, the inner city center will continue to use the combined sewer system with interceptors, while new development areas will use separated systems. Wastewater will be collected and treated in wastewater treatment plants (WWTPs).

**Solid waste plan:** municipal solid waste will be segregated for recycling before disposal at the landfill and all hospital wastes will be burn in special incinerators.

### 3.5 Master Plan Objectives for Environmental Protection

The importance of environmental protection and improved environmental sanitation are highlighted in the current development master plans, which set the following targets

- Prevent the risks of environmental pollution caused by socio-economic development activities.
- Protect the marine and coastal environment to sustain and enhance tourist development.
- Conserve and ensure reasonable use of natural resources, protection of bio-diversity, especially in the marine and coastal areas.
- Strengthen community education and training to increase environmental protection awareness.
- Strengthening environmental management capacity

4 EXISTING ENVIRONMENTAL CONDITIONS AND BASELINE DATA

The following sections summarize the existing environmental conditions for the Dong Hoi sub-project area. Additional baseline information is provided in Annex 2 and in the Pre-FS and CIP reports.

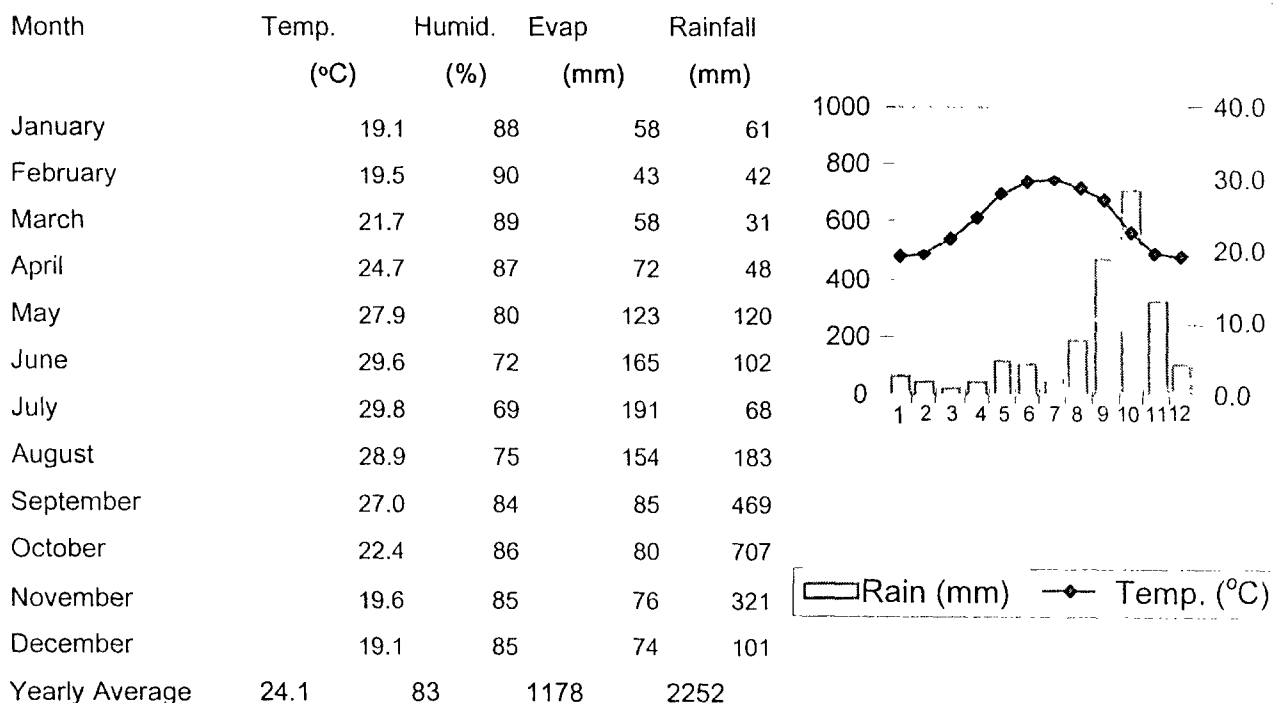
4.1 Climate Conditions

Dong Hoi is situated in the tropical monsoon zone and its climate is strongly influenced by both the northeast and southwest monsoon. The rainy season occurs during the northeast monsoon and lasts from September to March of each year, with heaviest rains concentrated between September - November. The areas' annual average rainfall is in the range 2,000-2,300 mm with average monthly rainfall ranging from a low of 44 mm to a high of 573 mm. The dry season occurs with the southwest monsoon and lasts from April to August with highest temperatures recorded between June - August.

Table I - 4.1: Monthly Average Wind Velocity (in m / second) and Direction: Dong Hoi

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Direction	NNW	N	NE	W	SW	NNW	WSW	WSW	NNW	NNW	N	N
Velocity	16	15	20	23	18	17	23	17	38	26	21	19

Figure I - 4.1 Meteorology in Dong Hoi (1978-1997)



Source: Meteorological Station of Dong Hoi - 1978 - 1997

4.2 Tropical Storms and Typhoons

Dong Hoi is located within the typhoon belt of the East Sea (South China Sea) and such tropical storms and typhoons generally occur from August to October. Recorded average storm wind speeds are 79 km per hour and highest recorded wind speed was 137 km per hour in 1964.

### 4.3 Topography and Soil Conditions

#### 4.3.1 Topography

Dong Hoi's topography is complex, consisting of steep hilly terrain surrounding flood plains and coastal sand dunes. East of the Nhat Le River is the Bao Ninh peninsula, which consists of steeply sloping sand with an average ground elevation is 10 m. West of the In Nhat Le River, the topography can be divided into 5 zones:

- Zone 1 and 4: consist of the city's center of Hai Dinh, Dong My, Dong Phu and Phu Hai wards, along National Road No 1A. This zone is rather low and flat, with an average elevation is 2 m.
- Zone 2: consists of Nam Ly and Bac Ly, which are located in the hilly western area of the city, with an average elevation of 10 m.
- Zone 3: Dong Son area, located along Road 15A is a low hilly area with average elevation of 8 m,
- Zone 5: Loc Ninh Area is mixed between hills and sea dunes with an average elevation of 10 m.

There is no comprehensive database or surveys available of soil and geological conditions for Dong Hoi but most soils in the urban center are sandy based on local reports and observations.

#### 4.3.2 Soil Conditions

Dong Hoi's topography is that of a low coastal plain, the soil consists of deposits of sand and clay with a little gravel. According to the result of geotechnical survey, the structure of layer through 12 boreholes in 4 wards: Dong My, Dong Phu, Hai Dinh, Bac Ly, Nam Ly (studied areas of Phase 1) is as follows:

Layer 1: The layer is dark yellow to grey alluvia layer with gravel, organic impurities. The consistency is medium dense, flexible to stiff. The layer is extends to depth of 0.0-2.2m.

Layer 2: Mud clay with dead arca, very dark grey organic impurities. The consistency is porous – flexible – soft plastic. This layer is encountered at depths of 2.0-4.9m

Layer 3: Composition is light, coarse sand with small gravel, white grey-to-light yellow. The consistency is dense, semi-stiff state. It is encountered at the depth of 4.0-7.0m

Layer 4: Composition is clay with little small gravel, yellow grey. The consistency is dense, semi-stiff state. It is found at the depth of 7.0-9.4m

Layer 5: Composition is sand with dust, motley, white grey, light pink. It is dense, stiff plastic. It is encountered at the depth of 4-9m

### 4.4 Flora, Fauna and Natural Habitats

Quang Binh is located within the biological zone of north Truong Son with has a recognized high level of biodiversity and endemic species, particularly in the Phong Nha - Ke Bang National Park, which is a UNESCO World Heritage Site. This unique national park is located 30 – 50 km inland from Dong Hoi and extends until the Laos border area. The actual sub-project areas have very limited natural flora and fauna due to the level of urban development. Non-urban lands of the sub-project area are widely used for farming, dominated by paddy rice. No undisturbed native vegetation or natural habitats remains in the general area. The nearby coastal areas largely consist of sandy to muddy beaches and offshore slopes.

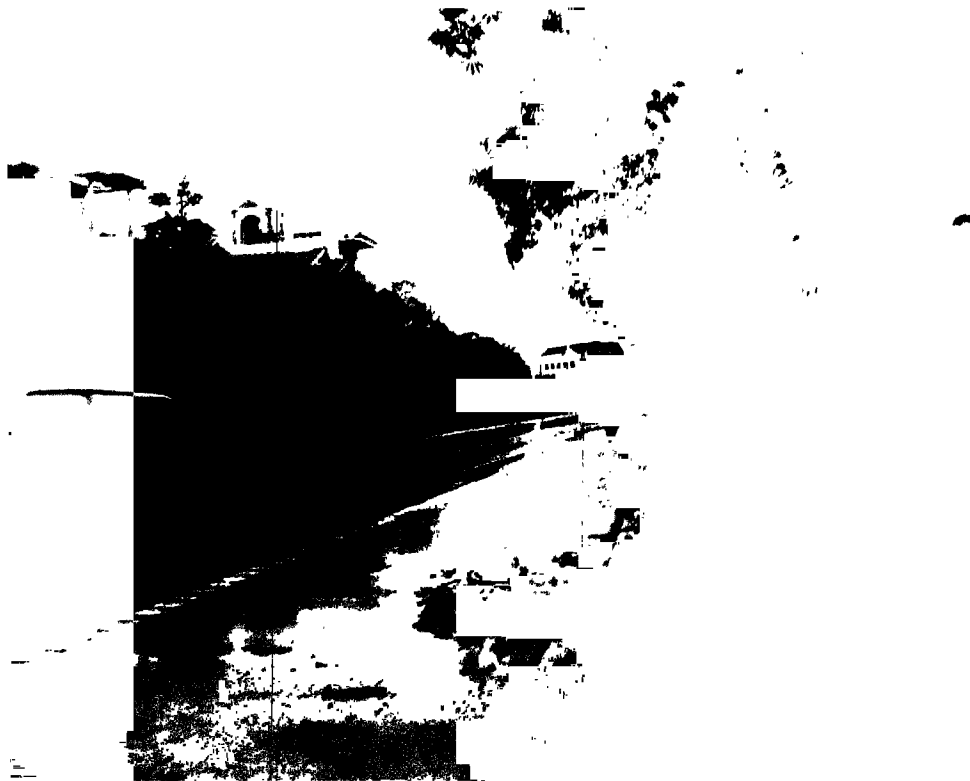
Representative photographs of the proposed sub-project areas are provided on the following pages.



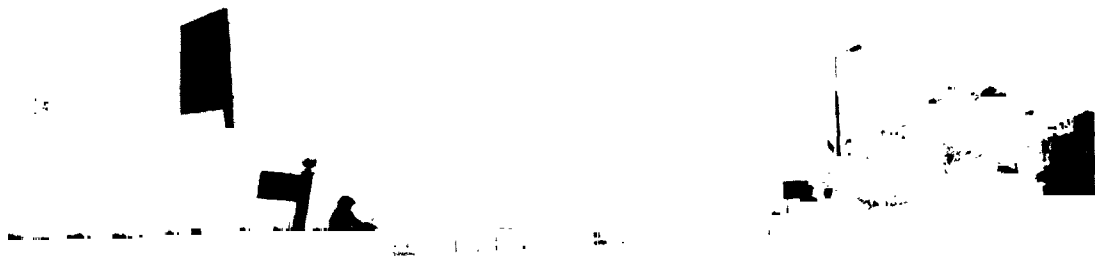
**Representative Existing Site Photographs:**



**Site:** Coastal Area along Nguyen Du Street



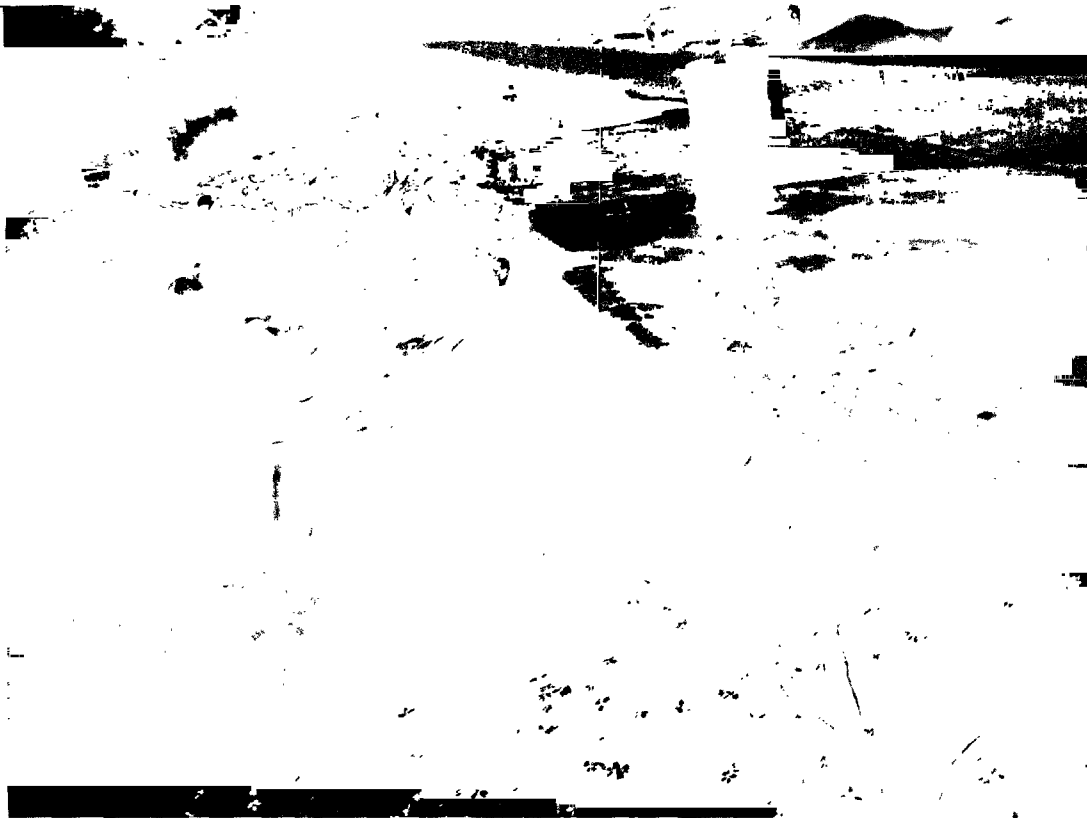
**Site:** Ly Thuong Kiet Street



**Site:** Phong Thuy Channel (at Hai Thanh Bridge)



**Site:** Phong Thuy Channel



**Site:** Combined Sewer Outlet at Phong Thuy Channel

#### 4.5 Sea and River Conditions

##### 4.5.1 Tides and River Hydraulics

There are four (4) main rivers within Dong Hoi city, namely the Nhat Le River, My Cuong River, Le Ky River and Cau Rao River. As the coastal plain and urban area of Dong Hoi is only about 2 m in elevation above sea level, the lower reaches of these rivers within the city center are generally saline and influenced by the tides which typically range from 0.75 to 1.5 m but during storm surges this can reach heights of 2 to 3 m. River flow and discharge volumes vary significantly between the wet and dry seasons. Information of DARD shows that Nhat Le river causes flood with the elevation of 1.8m and frequency of 50% in Dong Hoi city. A recorded flood level is up to 2.8 m above sea level with the frequency of 1%, causing flood levels of 2m above the ground in many areas of the city.

##### 4.5.2 Surface Water Quality

The Quang Binh DONRE maintains eight (8) water quality sampling stations in the sub-project area which are monitored on an annual basis (Figure I – 4.2). This monitoring program includes four (4) river and lake monitoring stations and four (4) coastal stations. A copy of these annual water quality monitoring reports is provided in Annex 2, a summary of which is provided in Table 1 – 4.2 which highlights the increasing concern for water quality in the sub-project area based on compliance with national standards. Summary results of water quality testing conducted as part of this EA are provided in Table 1 – 4.3 with the copies of the supporting laboratory results provided in Annex 2.

Figure I - 4.2 Map of Locations for DONRE

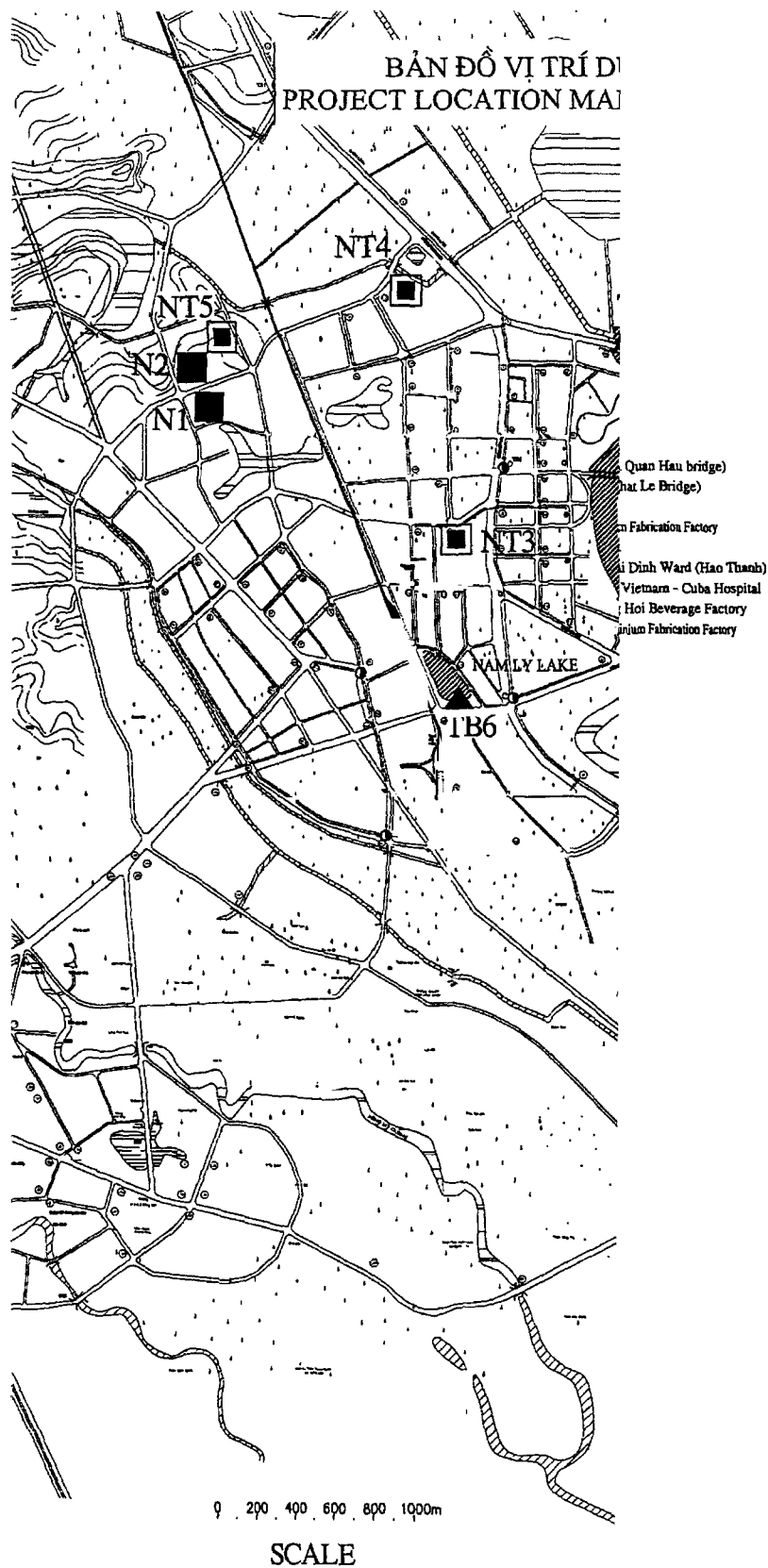


Table I - 4.2: Summary of Water Quality Monitoring Results of the Dong Hoi DONRE:  
Percent (%) of 2000 – 2003 Samples which Exceeded National Water Quality Standards

Source of Water Samples	Class A Water (recreational use)			Class B (agricultural use)		
	BOD <sub>5</sub>	COD	NH <sub>3</sub> -N	BOD <sub>5</sub>	COD	NH <sub>3</sub> - N
Near Wastewater Discharge Outlets	100 %	100 %	100 %	67 %	67 %	67 %
Near Factories & Industries	NA	NA	NA	16 %	67 %	100 %
Surface Waters (rivers & lake)	100 %	100 %	NA	20 %	74 %	NA
Coastal Waters	86 %	NA	100 %	50 %	NA	64 %

BOD<sub>5</sub> – Biological Oxygen Demand COD – Chemical Oxygen Demand NH<sub>3</sub>-N – Ammonia NA – not available

Table I - 4.3: Percent (%) of Samples conducted by CCESPEA in December 2005 – January 2006 which Exceeded National Water Quality Standards

Site	BOD <sub>5</sub>	COD	Coliform
T1	0%	66.6%	100%
T2	0%	50%	66.6%
T3	14%	71%	92%
T4	0%	7%	0%
T5	0%	33%	0%

Water Sampling Site Descriptions:

- T 1: Near outlet of Phong Thuy Channel to Nhat Le River
- T 2: Ho Thanh at outlet to Nhat Le River
- T 3: Nhat Le River at Dong Hoi Market
- T 4: Le Ky River
- T 5: Nhat Le River

The CCSP EA water quality testing results for dissolve oxygen (DO), suspended solid (SS), ammonia-nitrogen parameters all below standard levels. According to the results of water quality samples at the Table 1-4.3, it can be interpreted that the number of samples which exceeded standard, mainly appeared in the sites near by the outlets (T1, T2, T3) and the hygienic problems should be paid much attention (coliform) which create significant environment and public health near by these outlets concerns for increase discharge of untreated wastewater.

#### 4.5.3. Air Quality

Copies of available DONRE air quality monitoring data are provided in Annex 2. In general, air quality is good, although ambient noise levels are high along urban roads and districts.

### 4.6 Population and Socio-Economic Environment

#### 4.6.1 Population

A summary of the city's population distribution is provided in Table I – 4.4, involving a total population of 99,197 in 2004, with an average population density of 627 persons per sq. km.

Table I - 4.4: Population and density in 2004 (source: Statistical Yearbook 2004)

	Population		Area (km <sup>2</sup> )	Density (person / km <sup>2</sup> )
	Total	Female		
<b>Total</b>	<b>99197</b>	<b>49896</b>	<b>155.54</b>	<b>627</b>
<b>I. Urban</b>	<b>64307</b>	<b>32274</b>	<b>45.01</b>	<b>1295</b>
Dong Son ward	8413	4213	19.65	429
Dong Phu ward	7396	3705	3.81	1941
Phu Hai ward	3296	1646	3.06	1098
Hai Thanh ward	4418	2209	2.45	1803
Nam Ly ward	10809	5422	3.90	2771
Bac Ly ward	12828	6433	10.19	1270
Hai Dinh ward	3572	1786	1.37	2747
Dong My ward	2510	1260	0.58	4372
<b>Bac Nghia ward</b>	<b>6470</b>	<b>3236</b>	<b>7.76</b>	<b>833</b>
Duc Ninh Dong ward	4595	2356	3.13	1468
<b>II. Sub-urban</b>	<b>34890</b>	<b>17622</b>	<b>99.69</b>	<b>349</b>
Nghia Ninh commune	4401	2230	16.22	271
Duc Ninh commune	7381	3725	5.21	1416
Bao Ninh commune	8491	4290	16.30	520
Loc Ninh commune	7992	4036	13.40	596
Quang Phu commune	3016	1525	3.23	942
Thuan Duc commune	3610	1856	45.28	80

#### 4.6.2 Summary of the Socio-Economic Survey of Four Project-Affected Wards

Key Phase 1 activities will directly involve four wards (Dong My, Bac Ly, Hai Dinh and Dong Phu) for which socio-economic information is provided in the following section based on household surveys conducted in September – October 2005. A copy of the survey results is provided in Annex 2.

Table I - 4.5: Socio-Economic Classification of Households based on Surveys and Group

	Discussions (income values in VND)			
	Rich	Well-off	Average	Poor
<b>1. Dong My Ward</b>				
Monthly income / person	> 2 million	1 – 2 million	700,000–1,000,000	< 700,000
% of households	12% = 65HHs	18% = 117 HHs	49% = 318 HHs	23% = 149HHs
% of HHs with piped water	100	100	100	100
% of HHs with septic tank	100	100	100	100
<b>2. Bac Ly Ward</b>				
Monthly income / person	> 1.5 million	700,000–1,500,000	400,000 – 700,000	< 400,000
% of households	9% = 267 HHs	34% = 1007 HHs	47% = 1244 HHs	14%=415 HHs
% HHs with piped water	100%	45% using tap water, 10% use dug wells, 45% use drilled wells	30% using tap-water, 50% use dug wells, 20% use drilled wells	0%
% of HHs with septic tank	100%	75%	45%	No septic tanks.
<b>3. Hai Dinh Ward</b>				
Monthly income	> 2 million	1 – 2 million	500,000–1,000,000	< 500,000
% of households	18 %=150 HHs	30%=250 HHs	43%=358 HHs	9%=75 HHs
% of HHs with Piped Water	100	100	100	100
% of HHs with septic tank	100	100	100	100
<b>4. Dong Phu Ward:</b>				
Monthly income	>2 million	1 – 2 million	400,000–1,000,000	< 400,000
% of households	20%=386 HHs	26%=501 HHs	44%=849 HHs	10%=193 HHs
% of HHs with Piped Water	100	100	100	100
% of HHs with septic tank	100	100	100	100

Note: HHs = Households

#### 4.6.3 Public Health and Safety

As of 2004, there is 1 hospital, 2 local clinics, 8 others clinic centers and 13 health stations located with Dong Hoi city. The number of hospital beds in the province is 1,845, of which 552 hospital beds (29.9% of the total provincial hospital beds) are in Dong Hoi City. Based on survey results, the number of people who reported that they got sick within the last month was related to their reported income levels. Percent of surveyed households who reported that a family member was sick during the previous month:

- Poor households: 99 cases of reported illness in the preceding month (33% of surveyed HHs)
- Average income households: 72 cases of reported illness in the preceding month (24%)
- Better-off income households: 7 case of reported illness in the preceding month (2.3%)
- Rich households: 1 case of reported illness in the preceding month (0.3%).

#### 4.6.4 Provincial Economic Structure

On a provincial level, Quang Binh has a balanced economy, with a near equal mix of three economic sectors. (Table I - 4.6). The province's Gross Domestic Product (GDP) reportedly increased by 9.6% in 2004, with average income per capita of 1,099,000 VND / month (about USD 70 / month).

Table I - 4.6: Economic Structure of Quang Binh Province

No.	Economic Sector	Economic Structure (%)			
		2001	2002	2003	2004
1	Agriculture, forestry, aquaculture	35.4	34.6	33.7	32.5
2	Industry, capital construction	26.0	27.4	28.9	29.9
3	Services	38.6	38.0	37.4	37.6
	Total	100	100	100	100

#### 4.6.5. Tourism

Within the province and particularly in Dong Hoi City, tourism is of increasing economic importance, as indicated by the increasing number of tourists and revenue (Table I - 4.7). There are presently some 254 tourist establishments in Quang Binh province.

Table I - 4.7: Number of Tourists and Tourism Revenue, Quang Binh Province (2001 – 2004)

No.	Items	2001	2002	2003	2004
1	Tourists (persons)	140,240	166,500	200,367	252,142
2	Tourism Revenue (million VND)	3,781	6,084	7,540	13,482

#### 4.7 Status of Environmental Sanitation in the Sub-Project Area

The Pre-FS and CIP for the sub-project provide an extensive review of the existing environment, sanitation services and infrastructure in Dong Hoi City as a basis for supporting the proposed project implementation. Key findings of the Pre-FS review are summarized in the following sections.

##### 4.7.1 Drainage, Flooding and Wastewater

**Combined Sewers:** The total length of combined sewers within the city as of December 2003 is about 31 km, most of which are made of reinforced concrete (RC) pipe with diameters ranging from 300 to 800 mm and the remaining combined sewers are constructed of brick box culvert with concrete cover slab. The quality of these pipes and culverts, which were built in 1995-1997, are in good condition. The remaining sections built prior to 1995 are reportedly in a degraded and partly collapsed condition.

**Flooding Situation:** As a result of both the low laying elevation of some City areas and poor quality of drainage infrastructure and maintenance, floods are common in the following areas;

- Downstream of the Cau Rao River in Duc Ninh commune.
- Along Tran Hung Dao street, west of the Cau Rao River.
- Northern part of Viet Nam – Cuba Hospital property, in Bac Ly Ward.
- Paddy rice field areas of Loc Ninh commune.
- Urban areas of Dong My Ward and Hai Dinh Ward.

The general location of the flood and inundation areas of the City is shown in Figure 1 – 4.3. According to the socio-economic survey, 26.3% of households said that their houses are frequently flooded in rainy season and 29% reported that they are sometimes flooded. Of these respondents, 31.9%



of households reported that the flood waters drained after half day and 33.1% reported that the flood waters drained after 3 days.

**Sewage System and Wastewater Treatment:** The existing drainage system in Dong Hoi City is combined system; both wastewater and storm wastewater are collected in one system. This combined sewer system does not yet cover all of the city area, only in No.1 area (Dong Phu, Dong My, Hai Dinh wards) is the coverage complete. The total wastewater flow in Dong Hoi city is from 20,000 to 25,000 m<sup>3</sup> / day, in which the domestic wastewater flow is from 7,000 to 8,000 m<sup>3</sup> / day. According to the socio-economic survey, most surveyed households presently discharge their domestic wastewater into their garden (44.3 % of the total surveyed), while only 34% of households surveyed are connected to existing combined sewer system.

The industrial wastewater in the area reportedly has a high organic content because the main industrial activities in Dong Hoi are fish processing, beer and soft drink manufacturing and only few manufacturers are present, such as the Pre-shaped Aluminium Frame factory. In general, no proper wastewater treatment facilities currently exist in the small industrial factories in Dong Hoi. Only some larger enterprises are equipped with a simple treatment facility, but the level of treatment and quality of discharged effluents does not meet national standards. Most of the wastewater from hotels and hospitals passes through primary treatment provided by simple facilities such as septic or settling tanks before being discharged to the existing combined system. The Cuba Hospital is the largest general hospital in Quang Binh province with 200 beds. Average volume of wastewater generated by the hospital is about 300 to 500 m<sup>3</sup> / day and it has a high concentration of biological oxygen demand (BOD) and chemical oxygen demand (COD). This is the only hospital equipped with wastewater treatment / aeration facilities which are not operated or maintained properly.

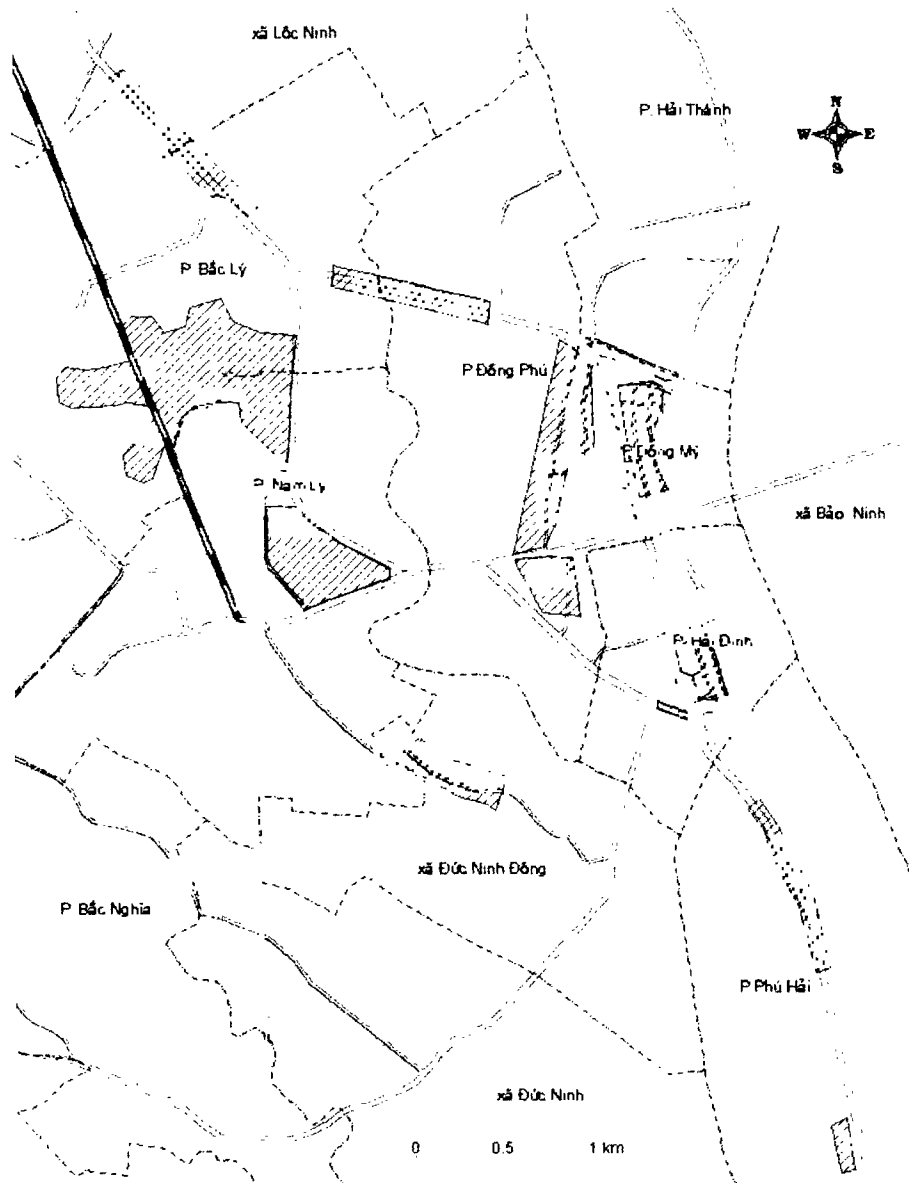


Figure I – 4.3 Location Map of Common Flooded Areas of Dong Hoi City

#### 4.7.2 Solid Waste Management

At present, solid waste collection service is mainly provided for the city's central urban area only, reportedly because it has a high population density, wider roads and streets enable collection truck and other equipment to access, and residents have the financial capacity of population to pay collection fees. Currently, 3 out of the city's 16 wards / communes do not have solid waste collection service and these are: Bao Ninh, Thuan Duc and Quang Phu. With its current capacity, the Quang Binh Urban Works Company (UWC) can reportedly only collect about 50 – 55% of the 36,000 tons of solid wastes that is generated annually, which consists of domestic wastes (22,000 tons / year), industrial and construction wastes (14,000 tons / year) and hazardous (medical) wastes (25 tons / year). For this solid waste collection, the UWC currently operates some 6 trucks for waste collection and conveying, supported by 147 push carts and 1 bulldozer.

Based on the Pre-FS, the summary composition of Dong Hoi's collected solid waste is provided in (Table I - 4.8). Important opportunities appear to be present to further reduce and minimize current and projected volumes of solid waste, particularly of recyclable and organic materials.

**Hospital Wastes:** The City's only incinerator is located in the Vietnam - Cuba Hospital but this incinerator does not meet proper sanitation criteria. The classification of domestic and hospital waste in this hospital is carried out regularly. The quantity of waste from other health services, such as private clinics is less, but it is not controlled or completely treated. Up to now, the UWC does not have a special vehicle or containers for handling hospital hazardous waste collection and transportation.

Table I - 4.8: Summary Composition of Urban Solid Waste, Dong Hoi

No.	Parameters	Rate (%)
1	Organic matter	40.8
2	Paper	5.7
3	Plastic	11.4
4	Glass	13.3
5	Metallic	1.2
6	Wood	22.7
7	Leather	0.3
8	Other	4.6
	Total	100.0

*Source: Quang Binh Urban Works Company.*

**Industrial Wastes:** Some industrial wastes are not fully and properly collected and disposed of. However, the current volume of waste from industries in Dong Hoi is not considered a major component of the total volume of wastes. Private enterprises enter into individual contracts for industrial waste collection service with the Quang Binh UWC. Some of these industrial wastes are reportedly disposed of informally and illegally in the City's open areas creating an increasing problem for water quality and public health.

**Waste from commercial facilities:** Unsorted wastes from hotels and restaurants are gathered in dustbins (waste storage containers), where it is collected by the UWC. The solid and vegetative waste on local beaches is also manually collected by the UWC workers in the same manner as waste collection from the city's streets.

**Waste from wet markets:** wet waste is put in the corner of the market and a compactor truck collects the unsorted waste daily for transport and disposal at the existing Loc Ninh dumpsite. If the truck does not arrive as planned or is under repair, the uncollected piles of wet wastes quickly create sanitation and health problems in the open market area.

#### 4.7.3 Status of the Existing Dong Hoi Dumpsite

The existing dumpsite of Dong Hoi is located in Loc Ninh commune area, which is about 8 km from the city center. This dumpsite covers an area of 13 ha, and started operating in 1995. It is situated in a hilly area, which has been planted to pine forest. According to the local authorities, the Loc Ninh dumpsite has been listed by the government as being in violation of environmental regulations and is planned to

be closed. The wastes deposited at this dumpsite are not levelled, compacted or well covered. Leachate is not properly collected and treated, and as a result, the leachate infiltrates directly to ground and pollutes water sources. The quality of this leachate as tested in 2002 (rainy season) is summarized in Table I – 4.9, indicating levels of COD and BOD above national standards.

Table I - 4.9: Quality of Tested Leachate from Loc Ninh Dumpsite, Dong Hoi City

(Test date: November 30, 2002)

No.	Test Parameters	Unit	Test Results	National Standards
1	PH		6.4	(5.5-9)
2	Chemical Oxygen Demand (COD)	mg/l	<b>240</b>	(100)
3	Biological Oxygen Demand (BOD5)	mg/l	<b>160</b>	(50)
4	Suspended Solids	mg/l	23	(100)
5	Nitrate	mg/l	0.6	
6	Ammonia (NH <sub>3</sub> )	mg/l	<b>11.6</b>	(1)
7	Iron (Fe)	mg/l	0.35	(5)
8	Lead (Pb)	mg/l	0.0014	(0.5)
9	Chrome VI (Cr)	mg/l	0.002	(0.1)
10	Hydrogen Sulfide (H <sub>2</sub> S)	mg/l	0.002	(0.5)
11	Cadmium (Cd)	mg/l	0.0039	
12	Zinc (Zn)	mg/l	0.104	(2)
13	Copper (Cu)	mg/l	0.0013	(1)
13	Manganese (Mn)	mg/l	0.011	(1)

Source: EIA for Closure of Co Cup Dumpsite, Dong Hoi Urban Development Project (DUDP)  
National standard values based TCVN 5945-1995 (B) "Industrial wastewater standards."

Under the Swiss-funded Dong Hoi Urban Development Project (DUDP), environmental assessment (EA) studies of both the closure of the Loc Ninh dumpsite and opening of a new sanitary landfill site in Ly Trach were prepared in 2002. Implementation of these two related projects is apparently still in progress, with approval by the Quang Binh Provincial People's Committee (PCC) in March 2005. As part of the EA process, a due diligence review was conducted by the CCESP International Consultant, with a report separately submitted to the Bank in February 2006.

## 5 ALTERNATIVES OF THE PROJECT

The proposed Phase 1 investments are preparatory to and directly linked to the subsequent Phase 2 investments. A description of the "without project" situation and alternatives that were identified in the process of preparing the Phase 1 sub-project components is provided in the following sections. Additional comments to the Pre-FS and recommended alternative considerations were provided by the International Consultant in its' "Review of the Pre-Feasibility Study" report (Oct. 2005).

### 5.1 Without the Project Situation

The preparation of the CCESP was initiated based on the understanding that the GoV lacked the financial resources to directly fund the proposed project investments. As a consequence, without project funding from the World Bank or other donors, it is assumed that these needed investments to improve environmental sanitation would not be able to be made by the GoV in the near future, if at all. As a result, public health risks and costs will increase and projected growth in economic development lead by tourism will be threatened. Delays in implementing the project as proposed may also lead to increased costs and social impacts at a later date, when current facility sites and needed right-of-way (ROW) areas may no longer be available.

Under this "without project" situation, the environmental sanitation conditions and related institutional capabilities will continue to decline, particularly within the densely population urban center. In contrast to recorded (1992 – 2002) annual population growth rates ranging from 1.0 %, official projections for 2003 – 2020 are 3.8 %. The generation and management requirements of liquid and solid wastes are expected to increase at even higher rates due to improving per capita economic conditions in the sub-project cities.

### 5.2 Drainage, Flood Control and Wastewater Collection Alternatives

Various alternatives were assessed during the Phase 1 preparation activities, including:

- Alternative sites of proposed WWTPs, which will be decided during Phase 2.
- Alternative routings and configurations of the drainage and wastewater collection systems to support the proposed alternative WWTP sites.
- Alternative capacity, pumping system and materials for the pipeline and channel systems.
- Options for making the household connections to new sewer systems.

#### 5.2.1 *Scheduling Options for Household Connections to the New Sewer System*

The pre-feasibility study recommends connecting 1,288 houses in Dong Hoi in Phase 1 before the wastewater treatment plants are completed in Phase 2.

Doing so would result in varying volumes of untreated wastewater discharged to the receiving waters thereby increasing:

- Pollution levels in the receiving water bodies;
- Exposure of human and livestock to polluted water; and
- The risk of waterborne diseases – diarrhea, cholera, typhoid, and dysentery.

In assessing this option, the following advantages and disadvantages of household connections to the new sewerage system were considered.

The main reasons often given for making the connections early (i.e. before the WWTPs become operations) are:

- a) It avoids excavating the street twice – once for the main line sewer and a second time when the house connections are made.
- b) It provides a large and or sufficient volume of wastewater to operate the wastewater treatment plants immediately after they are completed.
- c) The wastewater can be tested so that proper design criteria for the wastewater treatment plants can be established.
- d) The customers that are connected will realize immediate benefits from the fees they will start paying because they will get their septic tanks cleaned.

There are practical alternatives to the four (4) reasons advanced for the early connections

- a. Breaking the road twice: It is standard and normal practice in sewer construction to install the house connection laterals to the property or fence line – but within the property, at the same time the main line sewers are installed and by the same contractor. The end of the laterals in the property are then plugged and marked with a stake in the ground until it is time to connect to the houses. This avoids breaking and repairing the road twice.
- b. Sufficient wastewater to operate the plants: A significant volume of wastewater and enough to operate the plants initially can be obtained by making the following connections: Connect the hotel zone and the main commercial areas. The hotel zone is Tran Phu street, Hung Vuong street, Nguyen Thien Thuat street or in general the beach road and the streets west of the beach road.
- c. Design criteria: Domestic wastewater is similar from one place to the next even from one country to the next. The main factor influencing the characteristics of domestic wastewater is water usage pattern. There is nothing unusual about the water usage in Vietnam or the Coastal cities that would significantly affect the wastewater characteristics from the norm. Therefore the design criteria used elsewhere or those found in most textbooks can be used practically or conservatively here. Also, the design criteria must be established a long time before the house connections are made.
- d. Immediate benefits: Septic tanks are cleaned once every five to ten years. At best each household could expect to get their septic tank cleaned once if at all before the WWTP are completed. The risks and impact from prolong discharge of wastewater to the environment exceeds those of not cleaning the septic tanks for the 3-5 years to construct the septic tanks.

Connecting households to sewerage system before WWTPs become operational is unusual although there could be a good reason to do so when subsoil is predominantly clay or clayey, which would prevent the septic tanks from operating properly or would contribute to the wastewater writing to the

surface. However, in Dong Hoi, the subsoil is sand or sandy in nature, and drainage is highly effective.

With above advantage and disadvantage being considered, the following options were identified:

**Option 1:** No households are connected to the new sewer system until the proposed WWTPs are operational. Existing households connected to the system would be allowed to continue discharging their untreated effluents to the new combined sewer system.

**Option 2:** Proposed household connections to the new sewer system will be made during construction of the sewer and before the proposed WWTPs are operational in year 2 or 3 of Phase 2.

**Option 3:** The commencement of making the household connections to the new sewer system is delayed until six (6) months before the projected completion of the WWTPs to provide additional effluent flows within the system. Existing households connected to the system would be allowed to continue discharging their untreated effluents to the new combined sewer system.

Regardless of the option followed, there will be no increase in excavations to make the household connections if all options share the same design for installing lateral connections if they are installed to within the household property lines. So the issue of timing the connections with respect to excavations is not an advantage to any option. A summary of the identified advantages and disadvantages of each option is provided in Table I – 5.1.

**Table I - 5.1: Summary of Advantages and Disadvantages of Household Connection Options**

Option	Advantage	Disadvantage
Option 1	No increase in risk to public health and tourism.	May cause some delay in getting a significant flow to the WWTPs once these are completed. However, this can be resolved by connecting the hotel and commercial areas first.
Option 2	Earlier environmental sanitation benefits to connected household. Earlier collection of service fee revenues	Increase in pollution loads and concentrations from discharge of untreated effluents. Public health and tourism risks Prolonged risks if WWTP construction in Phase 2 is delayed
Option 3	No significant increase in risk to public health and tourism. Provides a reasonable flow to WWTPs once these are completed.	May present limited public health and tourism risks during 6 month period before WWTPs are operational. Potential risks are reduced if connections are made during rainy season when dilution and dispersion capacities are highest.

The most effective environmental mitigation measures for the additional pollution due to new household connections would be to postpone the household connections until the WWTPs are operational or advance the schedule for constructing WWTPs to provide treatment earlier in the

project period so that these project components are more closely linked (Option 1). However, if Option 2 above is selected, the new sewer system would be made during construction of the sewer and before the proposed WWTPs are operational in year 2 or 3 of Phase 2. Based on the assessment and hydraulic modelling calculations of this option indicate that the incremental effect of the new connections would be relatively small. Combined with the existing conditions as described above, however, the dilution and dispersion capacity of the receiving water bodies are not adequate to assimilate current discharge level within national water quality standards. Therefore, disallowing household connections is incorporated in project design as a mitigation measure in lieu of this alternative.

If it is agreed and locally approved to allow some household connections to the combined sewer system prior to completion of the WWTPs, this report considers the impacts, potential risks and presents some mitigation measures and guidelines.

### 5.3 Resettlement Alternatives

Component 4 is designed to address the compensation and resettlement requirements of the GoV and the Bank of the 42 project affected households currently residing along the Cau Rao River and Phuong Thuy Channel. Key safeguard issues of the Bank include the issues of consultation, compensation on the basis of "market" or "replacement" values and rehabilitation of lost income and/or livelihoods. Based on the separately submitted, alternative preferences of some households may involve adequate cash compensation as opposed to physical resettlement.

### 5.4 Retaining the Septic Tanks:

One objective of the project is to reduce the infiltration of septage and wastewater to the ground water. The question of whether to retain the existing septic tank in service after the house connections are made, to retain the newer ones, or to completely abandon all is still unanswered. The prefeasibility and feasibility studies done by the National Consultant state that most of the septic tanks are either not designed properly, not functioning adequately or both. The report states that approximately 87 percent of the wastewater penetrates to the surrounding soil. If this statement is true or mostly true then a significant (the majority) volume of the wastewater will be lost through the septic tanks to the surrounding ground and very little will be transferred to the treatment plants if they are retained in service after the house connections are made.

If the septic tanks are retained all should be 100% watertight and this should be confirmed by appropriate and recognized tests. The decision to retain should not be based on the age – i.e whether recently constructed or not, or whether likely to leak or not but rather that they are currently watertight and are more than likely to remain so for the life of the project. It will be difficult and costly maybe impossible to waterproof test all the septic tanks, and certainly it will be highly inconvenient. It would be a less costly to abandon all septic tanks.



## 6 ENVIRONMENTAL IMPACT ASSESSMENT

Based on completed studies and local consultations, the sub-project is expected to have significant positive benefits for the environment, public health and the tourism-based economy due to reduced frequency and level of flooding in the City's urban center, improved collection and handling of liquid and solid wastes, and supportive improvements in sanitation service and capacity. From an assessment of proposed Phase 1 sub-project components, baseline conditions and consultations, supported by the experienced gained from similar types of World Bank-funded projects in Vietnam, the following four (4) key sources of potentially adverse environmental impacts were identified and are recommended for detailed management, mitigation and monitoring measures:

- (1) Impact of the construction work;
- (2) Temporary wastewater discharges from the outlets at the Nhat Le and Phong Thuy Channel
- (3) Transport and disposal of dredged sediment
- (4) Impacts of mine and unexploded ordinance removal
- (5) Potential cultural impacts to the 200 year old Binh Quan Citadel

### 6.1 Impacts of Construction Work

The main activities of construction works during Phase 1 include:

- Street excavations to install drainage and wastewater system and restoring these areas
- Changing and installing 11 new inlets and 4 new discharge gates
- Providing 25,000 m<sup>2</sup> of new street pavement along upgraded sewer routes
- Transport of materials to the construction sites
- Temporary storage of dredged and construction material at the construction sites

#### 6.1.1 Street Excavations

The construction works for upgrading drainage and combined sewer systems will involve two catchments areas of Dong Hoi City, which are summarized in Table I – 6.1. Potential sources of environmental impact will include some 3,078 m of street excavations and an estimated 13,270 m<sup>3</sup> of excavated soil. These excavated materials are expected to consist largely of sand (the most common type of soil in the city's urban center) which will be directly re-used on-site for back-filling excavated pipeline trenches once installation has been completed.

The estimated construction period along each street section is in the range of 1 - 2 weeks, during which stockpiles of excavated materials along pipeline trench may cause dust (if excavations are conducted during the recommended dry season) and traffic problems is not properly managed. If excavations are made during the November – January rainy season, additional impacts are expected to include increased flooding, soil erosion into drains and adjacent streets, and unsanitary stagnant water filling open trenches.

Table I - 6.1 Summary of Proposed Excavations for Upgrading Drainage and Sewer Systems

Name of Street	Rehabilitate Old Sewer		Install New Sewer		Depth of Sewer (m)	Volume of Excavated Soil to be Disposed (m <sup>3</sup> )
	Diameter (mm)	Length (m)	Diameter (mm)	Length (m)		
Phan Boi Chau	400	346	800	485	1	405.6
Le Qui Don	300	220	1000	356	1.25	534
	400	156	1200 x 1000	40	1.25	72
Nguyen Du	400	212	800	234	1.1	247
	600	184	1200 x 800	168	1.1	266
Ham Mac Tu	500	203	1000 x 800	203	1	243.6
Ba Huyen Thanh	500	82	1200 x 1000	210	1.6	483.8
Quan	600	200	1600 x 1000	75	1.6	230.4
Nguyen Du	400	162	600	155	1.7	189.6
Tran Hung Dao	600	1247	1000 x 800	387	1.7	790
			1200 x 1000	200	1.7	490
Tran Quang Khai			1000	254		518.4
			1600 x 1200	255		930
			1800 x 1400	590		2676
Dinh Tien Hoang			1200 x 1000	420		1028
			2000 x 1600	268		1479
			2000 x 2000	450		2916
Hai Ba Trung			1200 x 1000	602		1473.6
			1600 x 1200	146		532.5
Thanh Nien	B600	181	800	280	0.6	
Nguyen Trai	500	120	1000	135	1.7	275.4
			1000	50	1.7	102
Nguyen Viet Xuan	B600	65	1000	162	1	
	B800	82	100 x 100	50	1	
	500	24				
Pham Tuan		141	800	178		256.32
Thanh Nien	400	42	1200 x 1000	50	1.55	111.6
Huong Giang	400	95	600	112	2.3	201.9
	600	87	1000	90	2.5	270
	400	136	800	290	1.33	370
	400	300	800	180	1.8	310.8
Quang Trung	400	300	800	180	1.8	310.8
Thach Han			1000 x 800	60		108
Le Loi	400	433	1000	430	1.3	670.8
	400	205				
Huu Nghi	600	853	800 x 800	338	1.12	363.6
			1100 x 1400	193		535.2
			600 x 600	180		168.5
			600 x 600	343		332
			1000 x 800	167		300.6
			3000 x 1500	843		6979
			4000 x 1500	129		1423.2
			1600 x 1200	885		3168
Tran Hung Dao						3168
<b>Total</b>		<b>1,491</b>		<b>3,078</b>		<b>13,270.1</b>

### 6.1.2 Dust and Air Pollution from Construction Vehicles

Dust and air pollution will be generated by construction vehicles in the work areas and along transport routes used for hauling materials. The total amount of soil materials to be excavated for the pipelines is 13,270 m<sup>3</sup> and it is expected that 50 % of these excavated sandy materials will be used on-site for back-filling trenches. Disposal of the excess materials may involve estimated 2,700 vehicles trips (in and out) if 5 ton capacity trucks are used on constructed road with the length of 3,078 m. Based on a

5-year project duration of Phase 1 (2007 – 2011), the proposed excavation works may involve an average of 2-3 vehicle trips per day along 3,078 km of pipeline routes.

Based on the methods of the World Health Organization (WHO, 1993, an estimate of the generated dust and other key air pollution parameters generated by transport-type vehicles is provided in Table I – 6.3 and I - 6.4. The existing baseline data (Annex 2) on some roads where the construction work will take place show that among the monitored parameters of air pollution (CO, SO<sub>2</sub>, NO<sub>2</sub>), the concentration of CO is still much lower than national standards while SO<sub>2</sub>, is slightly higher than the national standard for urban areas. During project construction, elevated levels of SO<sub>2</sub> will be a key air quality impact near the construction sites and along transport routes. However, this impact is identified to be short-term and limited to actual construction periods.

Table I - 6.2 Dust and Air Pollution Coefficient of Construction Vehicles (in kg / u)

Parameters	TSP	SO <sub>2</sub>	NO <sub>x</sub>	CO	VOC
Urban driving (per 1000 km)	0.9	4.29 x S	11.8	6	2.6

Source: WHO, 1993. S = the content of sulphur in fuel (from 0.2 - 0.5 %)

Table I - 6.3 Predicted Dust and Air Pollution Load Generated from Construction Vehicles (kg/day)

Parameters	TSP	SO <sub>2</sub>	NO <sub>2</sub>	CO	VOC
Urban driving (3 vehicle trips per day x 3.078 km)	0.08	0.198	0.109	0.055	0.024

### 6.1.3 Noise and Vibration of Transport Vehicles and other Construction Equipment.

The predicted construction noise that will be generated is mainly by the trucks transporting materials to/from the project site and taking out the excess excavation materials as well as any other construction equipment and machinery. The predicted noise levels one (1) m from the point source of noise is presented in Table I – 6.4 with the predicted attenuated noise levels with distance from noise sources based on the following formula (Pham Ngoc Dang, 1997):

$$L_p(X) = L_p(X_0) + 20 \log_{10}(X_0/X) \text{ (dB)}$$

$L_p(X_0)$ : noise from 01 with the source (dBA)  
 $X_0 = 1 \text{ m}$   $X$ : the location that needs to be calculated  
 $L_p(X)$ : the noise at the location that needs to be calculated

Table I - 6.4 Predicted Noise Levels from Construction Vehicles and Equipment

Type of Vehicle and Equipment	Noise Level - 1 m from Source		Predicted Noise Level 10 m from Source	Predicted Noise Level 20 m from Source
	Range	Average		
Bulldozer		93	73	67.0
Leveler	72.0	74.0	54	45.0
Excavator	72.0 - 84.0	78.0	58	52.0
Concrete mixer	75.0 - 88.0	81.5	61.5	55.5

National standard (TCVN 5949-1998): 50 - 75 dBA (between 6 AM – 6 PM) for residential areas

National standard for working environment issued by Ministry of Health: 85 dBA (8 hour work day)

During construction, the noise sources will be about 10 - 20 m away from residential areas. According to the existing baseline monitoring data (Annex 2), current noise levels along the city streets is around 65 – 75 dBA. Compared to baseline conditions, the noise generated by project construction vehicles

and equipment will be higher than existing transportation noise. However, the predicted noise levels 10 - 20 m from the construction sources are reduced. The noise also could be higher due to some noise sources operate at the same time and together with the transport vehicles (from 82 to 94 dB). In some cases, the noise could be higher than the national standards at a distance of 10 m from the noise sources. It is predicted that some residences and businesses along narrow streets could be affected by the noise during the construction period which is expected to last not so long time for each street section and the noise management will be applied as show in Part 2

#### *6.1.4 Impact to water environment*

Most of Phase 1 construction will be trenching and pipe installation. The construction will most likely establish an off site office and camps with shower and toilet for the workers as well as material storage and garage for vehicles. Workers will not be accommodated on the construction site.

Domestic wastes generated by construction workers can be estimated based on the maximum number of workers working in the construction period, which is estimated at 200 workers. The estimated amount of generated wastewater is 40 m<sup>3</sup>/day if workers are allowed to bath at the working location. If we don't have any mitigation measures, the estimated BOD<sub>5</sub> pollution could be in the range of 6 kg/day (30 gm / person / day).

The domestic wastes generated during construction could affect local areas, soil and ground water if proper mitigation measures are not applied during construction. If construction site toilets with septic tanks are applied for treatment, the load of organic pollution from wastewater will be reduced by 50 %.

The bad sanitary conditions at the construction sites caused by sediments and rubble, the worse effect on surface water quality of canals/channels (Nhat Le river, Phong Thuy channel) due to discharge of contaminated storm water, run-off water and domestic wastewater from workers sanitation.

The contaminated stormwater is generated from the sites under excavation, piles of construction materials. This stormwater contains high suspended solids such as grits and clays. The volume of this stormwater is dependent on the area of sites and open store of construction materials and storm intensity.

#### *6.1.5 Impact from domestic solid waste*

Estimated solid wastes generation would be in the 100 kg/day based on a rate of 0.5 kg / person / day and assuming that the workers are allowed to eat at the construction works. This is a small amount and will be collected and disposal by contractors.

#### *6.1.6 Leakage of Residual Grease and Oil*

During construction, grease and oil residuals may be generated from maintaining and preparing vehicle and machinery. According to technical documents, the average oil residual from construction machinery is around 7 liters per change of oil and the period of changing is every 3 – 6 months. If the estimated number of construction vehicles and related machinery is 30 units, the oil residuals that would be generated is around 30 -70 liters / month. The grease and oil wastes are recognized as a hazardous waste (code: A3020, Basel: Y8). If strict management measures for collection and disposal

of residual oils are not applied, such residual wastes can be a potential source for soil and ground water pollution.

### 6.1.7 Impacts to Traffic

Stockpiles of excavated soil and materials along the street excavation sites can cause temporary disruption of normal traffic flows and create public safety issues. Based on the above calculations, the amount of excavated soil can be a maximum of around of 3 - 4 m<sup>3</sup>/ m of road (in cases where main drains are being upgraded). If the height of soil stockpiles is about 1.5 m, the wide of road is 20 m, the temporary soil stockpile will occupy about 10 - 15 % of the roadway. For narrower streets, the percentage of roadway that may be temporarily blocked by soil stockpiles would increase proportionately. Most traffic using the project streets consists of motorcycles and bicycles, which can more easily adjust flow patterns. Proper traffic management and public safety measures are required to minimize these temporary traffic impacts and possible disruptions.

### 6.2 Discharge of Untreated Wastewater Effluents from New Household Connections

Based on the CIP, 80 % of the households in the wards of Dong My and Hai Dinh are expected to be connected during Phase 1, or a total of some 1,288 households (estimated 5,032 people). This compares to some 2,128 people that are reported to be connected now. The discharged of untreated wastewater effluents from the proposed new Phase 1 household connections would be made through a series of outlets, which are located close to each other along a short segment of Nhat Le River from the Cultural House in Dong My ward to the confluence of Nhat Le and Cau Rao River (including the confluence area). This large estuary – river mouth area represents the receiving water body for the outlet discharges during Phase 1. The four (4) combined sewer outlet areas that would be directly impacted in the Dong My Ward are

Catchments	Discharge Outlet
Phan Boi Chau street	Phong Thuy Channel
Nguyen Du street:	Nhat Le River (3 outlets - Le Qui Don, Han Mac Tu & Ba Huyen Thanh Quan)

The five (5) combined sewer outlet areas that would be directly impacted in the Hai Dinh Ward are

Catchments	Drainage Outlet
DONRE	Hao Thanh
Hung Vung	Hao Thanh
Nguyen Trai Street	Nhat Le River
Nguyen Viet Xuan Street	Nhat Le
Thach Han Street	Nhat Le

Due to the discharge locations of these outlets (Figure I – 6.1), the key concerns of impact from the new household connections are the changes in the pollutant concentrations in the Phong Thuy Channel (2 outlets) and Nhat Le River (7 outlets). This water body receives fresh water with high flow rate from upstream and also has high level of tidal exchange with the sea. Due to this high water exchange / flow rate and the close proximity of the nine outlets, the estimated pollution load is calculated as a single value for this impact assessment (Table I – 6.5) which served to:

- Estimate the total load of main pollutants in domestic wastewater discharged to the different receiving water bodies.
- Calculate the average concentration of the pollutants in each water body
- Assess the discharge impacts and compare with the Phase 1 plans with the existing situation (based on Vietnam's quality standards for different types of water classifications).

Figure I - 6.1 Location Map of Discharge Outlets for Proposed New Household Connections

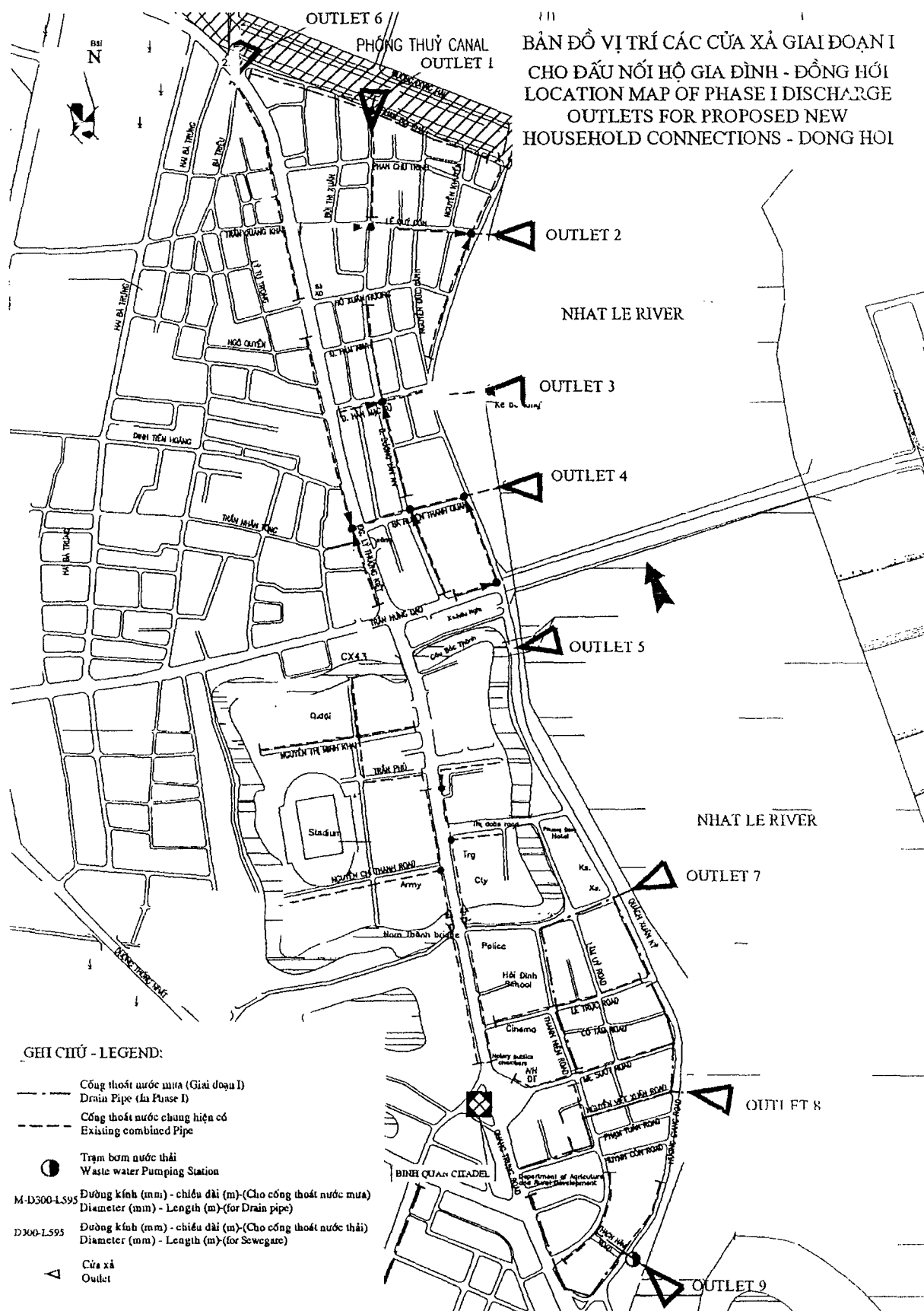


Table I - 6.5 Estimated Increase in Total Pollutant Load with Proposed Phase 1 Household Connections – All Discharge Outlets

	No. of People Connected to the Outlet System	BOD (kg/day)	COD (kg/day)	SS (kg/day)	TN (kg/day)	P <sub>2</sub> O <sub>5</sub> (kg/day)	Coliform (million microbes/day) × 10 <sup>6</sup>
Option 1	2,128	63.86	104.44	104.44	14.9	3.62	532,175
Option 2: Proposed new phase 1 household connections	7,161	214.82	358.04	358.04	50.12	12.17	1,790,175
Increase with Phase 1 Connections	5,032	150.96	253.6	253.6	35.22	8.55	1,258,000

In fact, it is presently very difficult to assess the actual treatment effectiveness of the existing septic tanks in city's areas. Therefore, to estimate the total load of domestic wastewater pollutants to be connected and discharged from the nine (9) outlets in Phase 1, the following "parameter of untreated values" from Standards for Infrastructure Construction (TCXD 51:84) were used:

Biological Oxygen Demand (BOD<sub>5</sub>): 30 gm/person/day

Total Nitrogen (TN): 7 gm/person/day

Phosphate (P<sub>2</sub>O<sub>5</sub>): 1.7 gm/person/day

Due to the lack of applicable standard for BOD, the load of COD will be applied from similar standards issued by WHO and US Environmental Protection Administration: 50g/person/day. For total coliform, the average value is 250 mils /person/day.

#### MODEL STUDIES:

A mathematical model was done to estimate the impact of connecting the houses planned in Phase 1. The following assumptions were made to simplify the analysis.

- The concentrations (BOD<sub>5</sub>, COD) and flow in the wastewater and receiving bodies are constant and uniform throughout.
- There is complete mixing of the wastewater and the receiving body on contact at the discharge points.

The likelihood of complete or near complete mixing of the wastewater and the receiving bodies occurring is dependent on:

- Width of the receiving stream or channel



- Depth of the receiving stream or channel
- Relative velocity of the stream and discharge
- Depth of the discharge.

Mixing to any degree – partial or complete will be promoted by turbulence (Reynolds No). In these coastal areas the receiving streams are generally considered as wide open channel i.e the width is greater than 5 to 10 times the depth, velocities are low in both the wastewater discharge and receiving streams. These conditions will inevitably result in laminar flow – and there will be very little or no mixing across boundary layers. The most likely occurrence is a narrow band of highly polluted water on the discharge side of the stream or canal for a length much greater than that predicted by the simplified model. The risks would also be significantly greater than that predicted using the complete mixing assumption as well. The model makes little or no allowance for an extended lack of rainfall or for variation in BOD<sub>5</sub>, both could markedly affect the results.

These assumptions will result in a simplified model, hence while the results and conclusions cannot be ignored but they must be reviewed accordingly and any decision based on the model analysis should consider the limitation and simplification of the model. Actual field results will always be higher than the model results because of the assumptions and simplifications. The difference between the two results will be a function of the relative difference in volume. If the volume of the wastewater discharge and the receiving body are close then the resulting concentration will be close to that predicted by the model. If there is a significant difference in volume there will be a corresponding difference between the actual field and model results. In the latter case the model results will be very unreliable.

**Impact Assessment of Pollutant Load Increase to Nhat Le River:** The initial concentration of any substance or microbial count of a river is determined by degree of initial dilution, which can be computed by the WHO method, through the following equation (Alexander P.E, 1993):

$$N_a = (Q_r N_r + Q_i N_i) / (Q_r + Q_i) \quad (1)$$

Where:

- Na, Pollution concentration of the river water just after discharge point
- Ni, Pollution concentration in the wastewater discharge stream
- Nr, Pollution concentration of river water just prior to the discharge point
- Qw, Input wastewater flow rate, m<sup>3</sup>/h
- Qr, River water flow rate (m<sup>3</sup>/h), in dry season

After the proposed new Phase 1 household connections are made, the predicted changes in pollution concentrations of the river water just after outlet discharge point can be computed based:

- Estimated increase in pollutant loads (Table 1-6.5)
- Available hydrographic information on the Nhat Le River
- Results of water quality testing conducted in December, 2005 and January, 2006
- Results of water quality monitoring conducted by Quang Binh DONRE from 2002 – 2005,

The predicted changes of pollution concentration in Nhat Le River are summarized in Table I - 6.6.

Table I - 6.6 Predicted Changes of Pollution Concentration in the Nhat Le River after Phase 1 Household Connections

	BOD <sub>5</sub> (mg/l)	COD (mg/l)	SS (mg/l)	Coliform MPN/100ml
At present (concentration in the river just after discharge point)	21.1	56.1	14.2	80.4 x 10 <sup>3</sup>
Phase 1 (concentration in the river just after discharge point)	21.58	56.86	15.04	80.68 x 10 <sup>3</sup>
Predicted Increase (%)	2.27%	1.4%	5.9%	0.35%
TCVN 5942: 1995, Column B	< 25	< 35	80	10 x 10 <sup>3</sup>

In addition to dilution and dispersion factors, the predicted increase in BOD<sub>5</sub> and coliform concentrations will be reduced through natural decay as measured by time or by the distance from the discharge outlet. For calculating these decay rates, the following formula and factors were applied:

$$N_t = N_a e^{-kt} \quad (2)$$

The relation between time  $t$  and the distance from outlet can be given by the equation:

$$L = (Qr + Qi)/(h \cdot l) \cdot t \cdot 24 \quad (3) \quad (m)$$

Where:

$N_t$ : Pollution of river water after the elapse of  $L$  (m) from outlet.

$K$ , decay rate constant is dependent on the stream water temperature, can be computed by following equation:  $K = K_{20} \Theta^{T-20} \quad (4)$

$K$ - die -off rate The reported value for coliform die off is in the range of 1.0 day<sup>-1</sup> for large streams to 1.8 day<sup>-1</sup> for medium size streams, while the constant  $\Theta$  is 1.075. If the average temperature in Nhat Le River is 25°C, then  $K$  for Nhat Le River is

$K_{20}$ , Microbial die -off constant at 20°C day<sup>-1</sup> = 1.8, so  $K_{\text{coliform at 26.5 }^\circ\text{C}} = 9.675$

$K_{20}$ , BOD<sub>5</sub> of = 0.08 day<sup>-1</sup>

$K_{\text{BOD5 at 26.5 }^\circ\text{C}} = 0.15$

$T$ , time

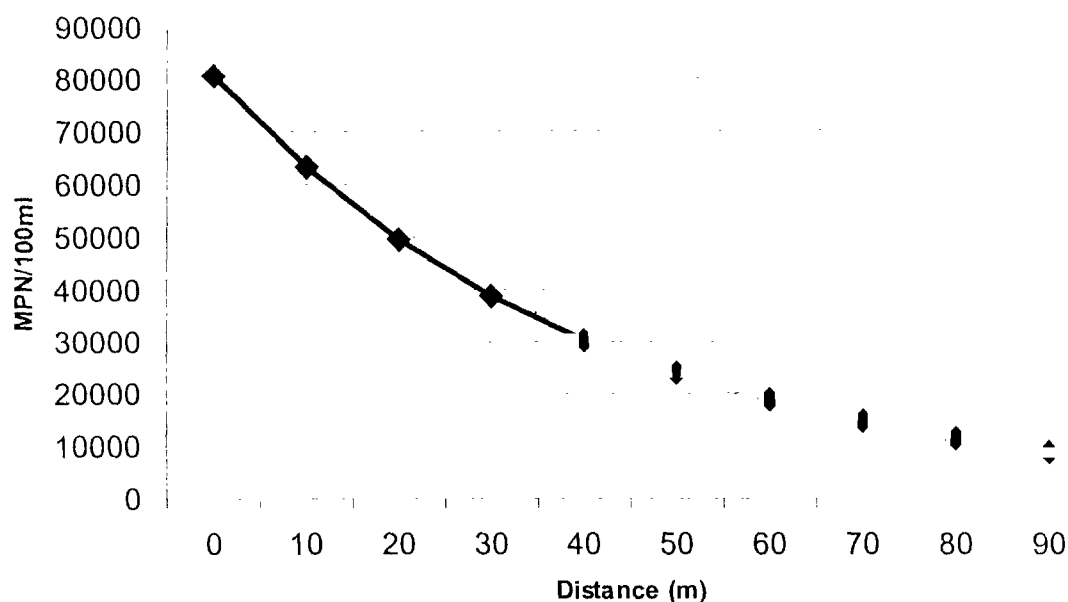
$L$ , distance downstream from outlet.

$h$ , the high level of water = 1.8 m

$l$ , the width of Nhat Le river = 570 m

Based on equation (2) and (3) above, the predicted reduction rates for coliform concentrations is presented in Figures I - 6.2

Figure I – 6.2 Predicted Change in Coliform Concentrations with Downstream Distance from Outlet



Based on these calculations, when additional household connections are made in Phase 1, it is predicted that the pollution near the outlets will be increased but not remarkably comparing to the existing pollution situation. The concentration of coliform, and COD near by the outlets in Nhat le River would be higher than allowed by national standards but these pollution concentrations are reduced with distance from the outlets. Based on the above calculations, the predicted concentrations for coliform will meet national standard within 90 m downstream of the outlets. These predictions are based on the assumption that all discharges will be made from just one outlet (due to the close proximity of the 9 outlets). If we could calculate the discharge impact of each outlet, it is predicted that the pollution concentrations would be more dispersed and impacted areas (decay distances to met national standards) may be closer to each outlet.

The sample taken from the site near by the outlet in Phong Thuy Chanel (see Station T1 in Annex 2.2) also showed that the COD and coliform parameters are much higher than allowed by national standards. The poor water quality of this constructed channel is visible to the naked eye with the black-gray color of wastewater near the outlets (see picture in Chapter 4). A special concern is raised for any additional discharges to this Channel along which Outlets 1 and 6 are located due to its existing poor water quality and a significantly reduced dilution and dispersion capacity as compared to the Nhat Le River.

#### Recommendation:

As described in Section 5.2.1, the existing COD and coliform concentration in Nhat Le river are exceeded the national standard. Although the analysis demonstrates that these concentrations in Nhat Le River will meet national standard within 90 m downstream of the outlets, the main concerns are the potential risks for public health, especially for the local communities along the river and those whose livelihood depends on the river. The most effective impact mitigation measure is to postpone the household connections until the WWTPs are operational or advance the schedule for constructing

WWTPs to provide treatment earlier in the project period so that these project components are more closely linked. However, if it is agreed and locally approved to allow some household connections to the combined sewer system prior to completion of the WWTPs, This report considers the impacts, potential risks and presents some mitigation measures and guidelines.

### 6.3 Excavation, Transport and Disposal of Dredged Sediments and Septage

Based on the sub-project CIP, the proposed areas and volumes of dredging activities are:

- Cau Rao River:	138800 m <sup>3</sup>
- Phong Thuy Channel:	23,900 m <sup>3</sup>
- Nam Ly Lake:	20,598 m <sup>3</sup>
-----	
- Sediment	183,298 m <sup>3</sup>
- Sewer:	520 m <sup>3</sup>
- Septic tank material:	78 m <sup>3</sup>

Key impact concerns of these proposed activities include potential impacts to existing aquatic ecology, air quality and safety; transport, and disposal.

#### 6.3.1 Impact of Sludge Excavation

The impact to aquatic ecology: The proposed dredging areas involve key components of the City's drainage, wastewater discharge areas and water storage system. The Cau Rao River is one of four main rivers of Dong Hoi City, which are connected by the Phong Thuy Channel. Most of the proposed dredging will be conducted along both sides of the Cau Rao River (13,880 m<sup>3</sup>), involving the North Bank (total length of dredging activities: 1,780 m) and the South Bank (total length of dredging activities: 1,770 m). To restore drainage capacity and river profile, a volume of about 55 m<sup>3</sup> will be dredged along each meter along these two river bank sections, involving dredging to a sediment depth of about 1 m. Based on site surveys, local consultations and information provided by the DONRE, the existing aquatic ecology and water quality conditions of the targeted dredging areas are poor. The proposed dredging activities are expected to help restore water flows, exchange capacities and quality in the lower sections of the Cau Rao River and Phong Thuy Channel as well as in the adjacent Nam Ly Lake. Following the short-term impacts of the dredging activities to benthic ecology and water visibility, it is expected that the drainage and water flow improvements will also help restore the ecological values of these waterways.

A key impact concern from turbidity impacts during dredging are the extensive (and illegal) shrimp pens located near the mouth of the Cau Rao River. To minimize such turbidity impacts, it is recommended that dredging schedules be locally planned and announced well in advance of actual activities so that shrimp farmers can time their activities and harvests accordingly.

### 6.3.2 Impact Disposal of Dredged Sediment and Transport

Sediment samples were collected within the proposed dredging areas in February 2006 and tested for key quality parameters to assess disposal impacts and any special handling requirements. The summary results of this sediment testing are provided in Table I – 6.7 and supporting laboratory results are provided in Annex 2. There is no Vietnamese sediment quality standard, so similar to recent EAs prepared for World Bank funded projects, quality standards and sediment classifications used in Dutch Soil Clean-up Guidelines (1995; 1999) were applied as summarized in the Table below.

Table I - 6.7 Summary of CCESP Sediment Quality Sampling Results: Dong Hoi Subproject  
(samples collected on February 10, 2006)

Sampling Site	pH	Total Solids (%)	Total Volatile Solids (%)	Total P mg/kg	Cn mg/kg	Pb mg/kg	Cr mg/kg	Fe <sub>2</sub> O <sub>3</sub> mg/kg	Cu mg/kg
TB 1	6.14	-	1.91	27.5	0.62	15.2	3.75	320	18.6
TB 2	5.76	-	1.7	18.75	0.25	12.5	1.25	196	13.8
TB 3	6.24	-	3.33	31.25	0.875	27.5	2.5	330	22.7
TB 4	5.48	-	1.36	13.75	0.375	12.87	1.25	381	8.75
TB 5	7.75	-	1.97	25.0	0.5	12.5	0.62	224	11.24
TB 6	7.78	-	2.27	6.25	0.125	13.75	1.25	68	5.72

#### International Standards (Dutch Soil Clean-up Guidelines; 1995; 1999)

"safe" values - can be used / disposed without treatment	< 530	< 380	< 90
"storage" values – should be safely stored and monitored	-	-	90 – 190
"clean-up" values – hazardous, must be properly treated	> 530	> 380	> 190

#### Sediment Sampling Site Descriptions:

- TB 1: Approximately 100 m from Bridge on Tran Hung Dao Road
- TB 2: In No.10 Sub – area, Dong Phu Ward
- TB 3: At outlet of combined sewer (800 mm diameter) to Phong Thuy Canal
- TB 4: Near Hospital Bridge
- TB 5: At Phong Thuy Canal near the Customs area
- TB 6: At Nam Ly Lake

P – Phosphate  
Cu – Copper

Fe<sub>2</sub>O<sub>3</sub> – Iron Oxide  
Cr – Chromium

Pb – Lead  
Cn – Cyanide

According to the results of the tested parameters and Dutch standards, the sediments to be dredged can be classified as the Class 1 and 2 or safe for use or disposal without treatment. Following general practices and land use in the area, it is expected that these dredged sediments will be used for agricultural and/or landscaping use near to the dredging sites. Due to the high organic content of these sediments, this use of such material for constructing river or lake embankments or for fill materials at the resettlement site are not recommended.

It is recommended that temporary "de-watering" and partial drying will be conducted along the river banks where dredging is conducted. This drying process will greatly reduce the volume and weight (about 50 %) of the dredged materials and reduce possible impacts from their transport. It is estimated that a drying area 20 m by 1,770 m along Cau Rao River and 8 m by 1500 m long along Phong Thuy Channel may be needed for recommended sludge drying activities which would need to

be conducted during the dry season to be effective. Based on recent site surveys, open areas for such sludge drying are available near the dredging sites.

In the case sludge is stockpiled and kept on-site for de-watering purposes, retaining structures and dikes will need to be provided to prevent sludge leakage to surrounding areas and surface waters.

The projected sediment volume is very large of some 183,298 m<sup>3</sup>, however as our recommendation that if the sediment is de-watering, the volume of sediment much reduce (around 100,000 m<sup>3</sup>). This volume may require an estimated 20,000 vehicle trips if typical 5 m<sup>3</sup> (in case the sediment directly transport out of dredged capacity trucks are used to bring dredged material to the selected disposal site(s)). The impact of these dredging and sediment transport activities will be distributed over a several year construction period and will primarily involve areas near to the lake areas which are less populated. Because the dredged sediment will be very wet, leakage of muddy materials and liquids will be an important impact concern during transport if the proper measures and vehicles are not used

### *6.1.3 Impact of Sludge and Septic Tank Management, Transport and Disposal*

At present, the septic material is managed by Public Works Company. The septic material is removed and transported by special vacuum trucks. Based on available reports, the volume of septic materials that is removed and transported is some 78 m<sup>3</sup>/year. With small volume of septic material and special vehicle, the impact to transport is not significant. Following anaerobic digestion in a properly functioning septic tank, the septic material is locally considered as a good and free fertilizer source, rich in nitrogen and phosphate. Following traditional agricultural practices, these septic materials are directly applied in rice field and gardens, which are very common around Dong Hoi. The volume of dredge sludge in sewer is small volume of 520 m<sup>3</sup> will need to be placed directly into transport tankers and brought to the disposal sites, it is recommended in the landfill, to minimize storage time and impacts at the site.

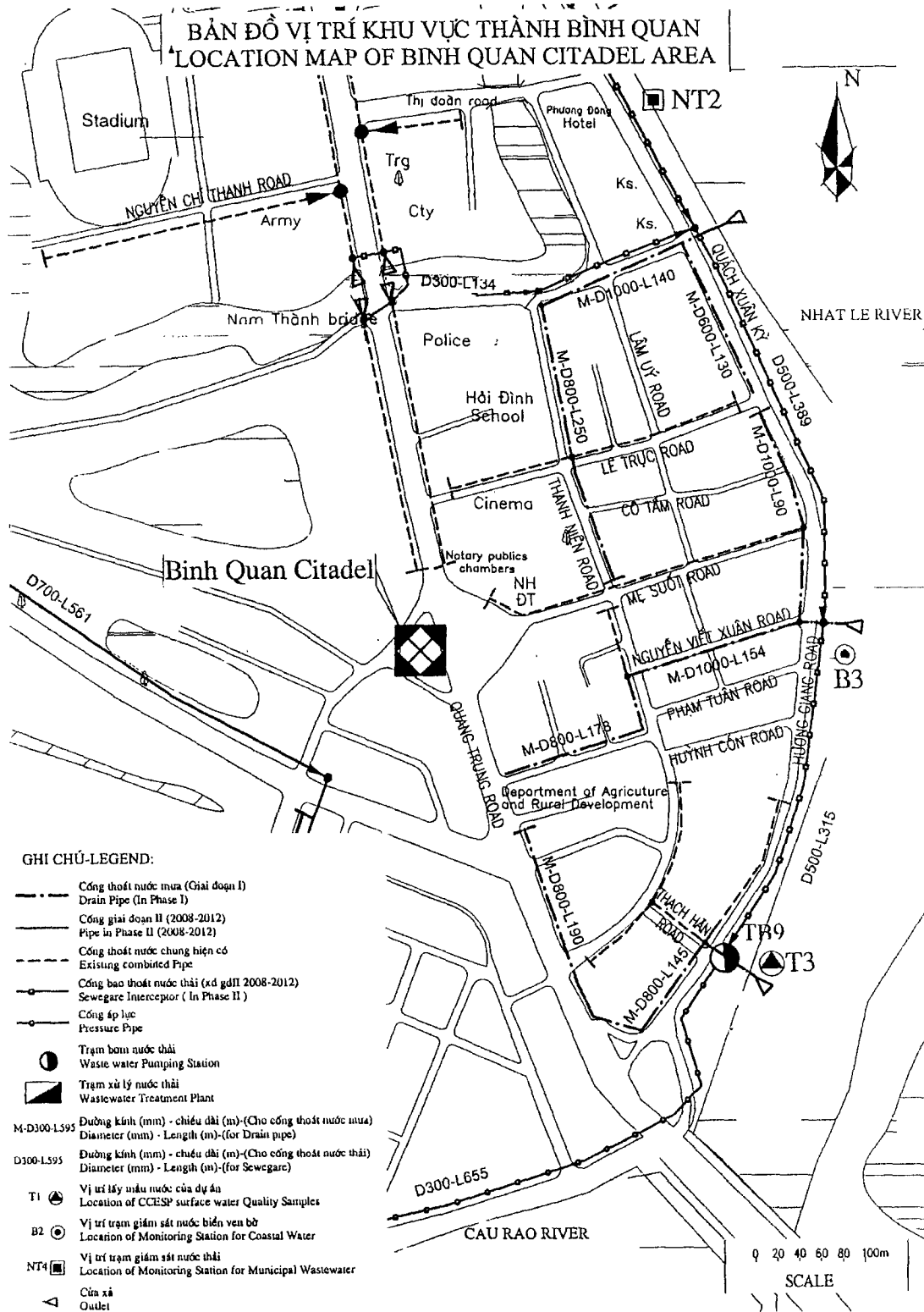
### **6.4 Impact of Mine and Unexploded Ordinance Removal**

The potential presence of unexploded mines and ordinance is a recognized issue in the Dong Hoi area. Local concerns for potential impacts to residents and work crews during construction included areas to be excavated under the city streets and areas to be dredged. Within the CIP cost estimates, budgets are provided for de-mining operations of proposed project sites. To minimize potential impacts, these activities will need to be well coordinated with concerned agencies and capable sub-contractors well in advance of proposed work schedules.

### **6.5 Potential Cultural Impacts to the Quang Binh Citadel**

Based on site surveys and local consultations, the proposed sub-project sites do not include any known physical cultural resources, with the noted exception of the 200 year old Quang Binh Citadel. Proposed drainage works in the Citadel area (Figure I – 6.2) are located more than 150 meters away from this historic structure which is currently being renovated by the Department of Culture and Information, including similar types of drainage improvements to help protect this building from floods.

Figure I – 6.4 Location Map of Binh Quan Citadel and Proposed Phase 1 Activities



6.6 Septic tanks:

One objective of the project is to reduce the infiltration of septage and wastewater to the ground water. The question of whether to retain the existing septic tank in service after the house connections are made, to retain the newer ones, or to completely abandon all is still unanswered. The prefeasibility and feasibility studies done by the National Consultant state that most of the septic tanks are either not designed properly, not functioning adequately or both. The report states that approximately 87 percent of the wastewater penetrates to the surrounding soil. If this statement is true

or mostly true then a significant (the majority) volume of the wastewater will be lost through the septic tanks to the surrounding ground and very little will be transferred to the treatment plants if they are retained in service after the house connections are made.

If the septic tanks are retained all should be 100% watertight and this should be confirmed by appropriate and recognized tests. The decision to retain should not be based on the age – i.e whether recently constructed or not, or whether likely to leak or not but rather that they are currently watertight and are more than likely to remain so for the life of the project. We believe it will be difficult and costly maybe impossible to waterproof test all the septic tanks certainly it will be highly inconvenient. It would be a less costly to abandon all septic tanks.

Retaining the septic tanks (or some of) or the project will incur four (4) additional costs:

- Cost of cleaning and maintaining the tanks periodically
- Transporting the septage to the treatment plants or landfill sites
- Treatment
- Cost of storage in the landfill

All these costs which can be substantial but would be avoided if the septic tanks are abandoned. The cost of treating septage is especially prohibitive because the septage is several times stronger than domestic wastewater. The wastewater treatment plants would also require special design to handle anything other than low volume of septage.

It is normal practice elsewhere to connect the households directly to the mainline sewer for this type of system and to design the treatment process accordingly.

There is no good reason or significant advantage to retain the septic tanks after the house connections are made. The treatment plants will be designed for domestic wastewater consistent with direct connection to the system.

Accordingly, we recommend that all the septic tanks in the system be abandoned at the same time the house connections are made. This will also avoid excavating twice in the premises.

## 6.7 Impacts Identified during Public Consultations

### 6.6.1 Public Consultation Meetings

Following completion of the Pre-FS, initial consultations were held in February 2005 with local government agencies, lead by the Provincial People's Committee (PCC) and the DONRE, and other concerned stakeholders. These initial consultations focused on pipeline route alternatives, transfer stations, public toilets and potential impacts. The consultation Minutes are provided in Annex 3

### 6.6.2 First Stage of Public Consultations



As required by the Bank safeguard policies, a first stage of public consultations with PAPs and local community representatives was conducted in September – October 2005 and involved household surveys and interviews of some 300 households in the directly affected communities, a sample size representing 5 % of the total population of three wards that are a focus of Phase 1 subproject activities. No objections to the project or environmental and social concerns other than those addressed in the EA were raised during the consultative process. A summary of these conducted household surveys and consultations are provided in **Annex 3**. Prior to conducting these household surveys, focus group discussions and consultative meetings were organized and conducted on September 29 – October 10, 2005 with a total of 81 local community leaders and members.

### *6.6.3 Second Stage Public Consultations*

A second and final stage of consultations focusing on the draft EA report was organized and conducted on December 27, 2005. This half day consultation, involving 20 participants was held in Dong Hoi City and the complete Minutes are provided in **Annex 3**. This second stage of consultations was supplemented by a written questionnaire survey conducted in February 2006 for stakeholders residing near proposed discharge outlets. In addition to general support for the proposed project, the key impact concerns that were raised by the 20 surveyed households included:

- The existing problems in respondent's area:
  - Pollution by traffic (dust, noise, and air emissions)
  - Pollution from open channel
  - Flooding during heavy rain and tides
  - Uncollected garbage
  - Lack of household toilets
- Expected environmental impacts during construction of Phase 1 investments:
  - increased traffic
  - Increased noise
  - Increased dust
  - Increased accidents
  - Interrupted water supply
  - Stockpiles of materials and dredged sediment
  - Increased garbage from construction
  - Increase odors
- Expected environmental impacts of increased outlet discharges during Phase 1:
  - Increase pollutants in the river
  - Impacts to ground water
  - Increased odor
  - Increased public health risks
  - Increased mosquitoes and flies
- Recommended mitigation measures for increased outlet discharges:
  - Use chlorine for disinfection
  - Install coarse screen
  - Monitor water quality

- Regularly check and dredge areas near outlets
- Conduct public awareness program

All the responses are ranked by the no, light, moderate affects. The most common concerns about the existing environment are the polluted condition by open channels (80% correspondents) and the pollution caused by traffic (45%) and uncollected garbage (40%). During the construction stage, the most common impact concerns were increased odor (80%), noise and dust (65 and 60% respectively). The most common concern about the expected impacts of increased outlet discharges with the proposed new Phase 1 household connections are:

- Increased odors near discharge areas (100 %),
- Mosquitoes and flies (100%)
- Increased public health risks (95%),
- Increased level of pollutants in the river (85%).

During construction, most of respondents agreed with the impact mitigation measures proposed in the draft final EA. For the proposed Phase 1 increase in outlet discharges, most people considered that the proposed impact mitigation measures have moderate effects.

Public Disclosure: Complimentary to public consultations, public disclosure of the EA report is required in accordance with World Bank Procedure (BP) 17.50. The draft EA was disclosed in Washington DC and the Vietnam Development Information Center (VIDC) in Hanoi by January 19, 2006. The Vietnamese translations were disclosed by January 13, 2006. All documents were disclosed locally by the Provincial People's Committee (PCC), the provincial Department of Natural Resources and Environment (DONRE), the Project Preparation Units (PPUs), offices of the Wards in which people will be affected by the project, and were accessible to local NGOs and PAPs.

## Part

**2****ENVIRONMENTAL MANAGEMENT PLAN**

---

**7 MITIGATING MEASURES****7.1 Introduction**

The environmental management plan (EMP) consists of the set of mitigation, monitoring, and institutional measures to be taken during implementation and operation to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels. The plan also includes the actions needed to implement these measures. In accordance with the Bank's OP 4.01, the EMP serves to:

- (a) Identify the set responses to potentially adverse impacts;
- (b) Determine requirements for ensuring that those responses are made effectively and in a timely manner; and
- (c) Describe the means for meeting those requirements.

**7.2 Mitigation Measures during Detailed Design****7.2.1 *Generic Design Instructions***

Environmental matters have to be integrated in all the design work and planning of the project. The detailed designs need to minimize adverse impacts on environment by maximizing the use of existing facilities and selecting the location of new facilities in areas where the disturbance to the environment, people and existing structures is minimized. Where possible, existing right-of-way (ROW) areas should be used rather than create new ones. The key mitigation measures will be provided in the Project Implementation Plan, Engineering Design Reports, Bidding Documents and Contract Documents.

According to the Vietnamese Construction Regulation Standard Article 3.3 (Protection of the Natural Resources and Environment), construction projects should:

- Not cause adverse effect to environment, and technical regulations on scenery and environment protection should be observed,
- Protect natural preservation areas, and historical, cultural and architectural places,
- Ensure rational and sustainable use of natural resources, and
- Respect traditional customs, practices, and religions of local people.

In the Vietnamese Construction Regulation Standards, there are general instructions especially for the design of sewerage and drainage systems to ensure that the constructed systems are:

- Able to discharge all types of urban waste water ,

- Suitable solution for treating wastewater so that the urban area is not flooded and environment and water sources are not polluted.

In the national standards for Branch Sewerage and Drainage System Works, there are more detailed design instructions which will be supplemented as needed under the project by international design standards to enhance the overall designs and environmental mitigation measures they provide. As part of the detailed design, the construction works will also be scheduled in an appropriate manner to minimize the movement of construction equipment and disturbances to the site and nearby communities.

### *7.2.2 Drainage and Sewerage*

In the design of drainage and sewerage, attention has to be paid to preventing the possibility of contaminating the domestic water supply. Special attention has to be paid to the possible crossing of water pipes and sewers. For this purpose, it will not be allowed to have water pipes going through the same drainage manholes or box culverts. If possible, the drainage and sewer systems should be designed to be located as far as possible from water pipelines. Discharging points of the drainage system have to be selected so that the adverse impact is minimized and the back flow of drainage water to pipes is prevented or minimized. Drainage design principles have to be selected in cooperation with the other projects being implemented in the same area to ensure consistency between projects and to optimize the effectiveness of the constructed drainage system with minimal site and community disturbance.

Upgrading and dredging of channels has to be designed to minimize the need of resettlement and to assure proper construction and maintenance access is provided. Transport and disposal of excavated material has to be properly designed and appropriate disposal areas identified and reserved. To minimize transport and off-site impacts, maximum on-site or near site use of excavated and dredged materials will be encouraged. Deposited solid wastes and any contaminated sludge materials which are blocking existing drainage pipelines and channels will be transported to the landfill for disposal, but most excavated organic materials can be used locally for agricultural and landscaping purposes. Handling and disposal of sediment and solid waste to specified places with suitable means of transport has to be coordinated with relevant authorities.

### **7.3 Mitigation Measures during Construction**

All construction work funded by the sub-project will need to be implemented in accordance with the appropriate standards, specifications and Bidding / Contract Documents. The preparation of these Bidding / Contract Documents as well as the TOR for the construction management consultants (CMC) will be subject to Bank reviews and issuance of a No Objection Letter (NOL). A summary of these measures which have proven effective in managing potential environmental impacts during construction is provided in Table II – 7.1.

Table II - 7.1 General Environmental Mitigation Measures during Construction

Impact	Environmental Mitigation Measures
Noise, Odor, Litter and Dust	<ul style="list-style-type: none"> <li>• The maximum permitted noise levels shall be those in the Vietnamese standard TCVN 5949:1998 applicable to residential areas (The strongest limitations are from 10 pm to 6 am in the vicinity of hospitals, libraries and kindergartens where maximum noise level is 40 dB).</li> <li>• Air quality and dust emissions shall be mitigated through dust suppression measures required by TCVN 5937:1995 for residential areas</li> <li>• Appropriate equipment shall be used to prevent overloading of trucks. Accidental spills, sludge, oils and lubricants from equipment etc. shall be absorbed and collected immediately.</li> <li>• At the construction sites dust, litter and public inconvenience shall be minimised by good construction management and supervision.</li> <li>• Water shall be sprinkled in streets in the vicinity of construction sites to avoid dust.</li> <li>• Streets shall be kept continuously clean of mud, dirt, spillage and waste from the construction activities</li> <li>• The contractor shall immediately remove any materials or liquids that cause offensive odours to nearby residents.</li> </ul>
Waste Disposal	<ul style="list-style-type: none"> <li>• Solid household and commercial wastes shall be collected from work sites and transported to to an approved URENCO the landfill</li> <li>• Dredged or excavated materials shall be removed from the works sites to disposal sites selected by the contractor, provided that they are not contaminated. Any contaminated materials shall be transported to sites approved by URENCO and DONRE</li> <li>• No waste material shall be stored on site for more than 24 hours</li> <li>• Water from excavations or stream diversions shall be discharged only to an existing drain or stream. No discharges shall be made to land or public areas.</li> </ul>
Public & Private Property	<ul style="list-style-type: none"> <li>• The contractor shall not cause any damage to public or private property during the construction work. He shall adequately support all excavations to avoid movement or undermining of adjacent ground. He shall compensate the owners for any damage except where damage is unavoidable due to the permanent works</li> <li>• The contractor shall not sever or interfere with any utility services unless the owner has consented to suitable temporary arrangements.</li> </ul>
Health and Safety	<ul style="list-style-type: none"> <li>• The Contractor shall provide appropriate safety equipment, tools and protective clothing to the workers and ensure that safe working methods are applied.</li> <li>• Facilities shall be provided for worker to wash with clean water during and after the working hours.</li> <li>• Clean water and first aid kit shall be available to wash and treat any cuts and wounds.</li> <li>• The contractor shall follow the national safety and health regulations during the use of selected earth stabilisation and support methods in excavation work.</li> </ul>

Impact	Environmental Mitigation Measures
	<ul style="list-style-type: none"> <li>• Protection masks against dust shall be provided to the workers.</li> <li>• The contractor shall provide and maintain safe temporary accesses through construction sites for residents to reach their properties</li> </ul>
Traffic and Transport Arrangements	<ul style="list-style-type: none"> <li>• All works shall be carried out so as not to interfere unnecessarily with public access to and use of roads and footpaths to or from properties. The width of the contractor's vehicles shall not exceed half the available width of any access road, street or alley</li> <li>• The contractor shall select transportation routes, choose vehicle weights and distribute loads so that the transportation from and to the site shall not damage roads and bridges</li> <li>• Tracked vehicles shall not be used on paved roads</li> <li>• Where permanent access routes are to be constructed as part of the works they shall be used in preference to roads through residential areas</li> <li>• The Contractor shall be responsible for any damage to roads and bridges</li> </ul>
Working Time and Site Arrangements	<ul style="list-style-type: none"> <li>• Working time shall not extend before 7a.m. nor after 6pm.. There shall be no working on Sunday</li> <li>• Site arrangements and instructions concerning site clearance, fencing, watching and lighting, given in contract documents shall be followed by the contractor.</li> </ul>
Public and Community Relations	<ul style="list-style-type: none"> <li>• Construction methods at each work location shall be agreed in advance between the contractor, DONRE and the PMU's supervising consultant. Method statements shall be submitted by the contractor simultaneously to the supervising consultant, the PMU and to DONRE. The construction methods for each location shall be agreed by discussion of the method statement at a meeting attended by representatives from the contractor, DONRE, the PMU and the supervising consultant.</li> <li>• When required by DONRE or the PMU the construction method statement shall be explained and discussed at a meeting with residents or their representatives</li> <li>• The PMU shall announce the construction works and all arrangements in the method statement which are relevant to the public during construction work. The information shall be conveyed to the public by newspapers, TV and radio. Locally the announcement should be given to the ward representatives who will inform the residents. Loudspeakers could be used during the construction work to give the latest information in concerning areas.</li> </ul>

Supporting environmental mitigation measures during construction are detailed in the proposed Standard Operating Procedures (SOPs) provided in **Annex 4**, which include specific guidance to the contractor on the following common aspects of civil works:

1.2 Discoveries	1
3.1 Mobilization and Demobilization	2
3.2 Field Offices and Facilities	2
3.3 Transportation and Handling	3
3.4 Maintenance of Traffic Flow	4

B. Temporary Traffic Control	5
C. Maintenance for Traffic Safety	5
3.5 Field Engineering	5
3.6 Materials and Storage	5
3.8 Cleaning	6
3.9 Environmental Aspects	7
3.10 Earthworks	11
3.13 Maintenance of Adjacent Roads and Bridges	

### 7.3.1 Specific Mitigation Measures during Construction Activities

**Co-ordination with other agencies:** The contractor and PMU will co-ordinate with other agencies to ensure existing utilities, especially underground utilities are protected and not damaged by the construction activities.

**Site Regulations and Safety:** The contractor shall prepare and submit proposed site regulations for the PMU's approval prior to the start of construction. Such site regulations shall include, but not be limited to, rules in respect of security, safety of the facilities and public, gate control, sanitation, medical care, and fire prevention. Signs to show the name of the project, the name of employer and the name of contractor have to be located in visible places in the construction site.

**Noise, Odor, Litter and Dust:** The maximum level of noise that will be permitted in public and residential areas is defined in Vietnamese standard TCVN 5949-1998. The strongest limitations are from 10 p.m. to 6 a.m. in the vicinity of hospitals, sanatoriums, libraries and schools where maximum noise level allowed is 40 dB.

The contractor is responsible to collect all the solid waste from work sites and transport it to the landfill. In the construction sites, dust, litter and public inconvenience have to be minimized by good construction management and site supervision. To minimize dust emissions caused by construction works regular, sprinkling or preferably wetting of the streets is recommended. Streets that are prepared for asphalt restoration will be sprayed with a prime coat of MC-30 asphalt to mitigate and suppress dust creation. If there is a need for the incineration of any solid wastes at the construction sites, an appropriate control measure is required, and the local authorities will be informed of these activities prior to their implementation. Waste and disposal of excavated materials has to be disposed at the sites, which are agreed with URENCO. Appropriate equipment should be used to prevent overloading of trucks and to collect accidental spills (sludge, oils from equipment, etc.) during the construction works.

**Safety, Security and Protection of the Environment:** The contractor shall, throughout the execution and completion of the works and remedying of any defects therein:

- All local health requirements and safety methods and instructions as described in the Contract Documents will be followed. For any proposed work camp where workers will stay overnight, the contractor will be responsible for providing appropriate guidance and information material on community relations and HIV / AIDs prevention in coordination with local health officials. Full regard will be given by the contractor for the safety of all persons entitled to be upon the site and keep the site and the works in an orderly and safe condition.

- Provide and maintain at his own cost all lights, guards, fencing, warning signs and flagmen, when and where necessary for the protection of the works or for the safety and convenience of the public or others, and
- Take all reasonable steps to protect the environment on and off the work site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.

During the construction works, the contractor shall keep the site reasonably free from all unnecessary obstructions and shall store or dispose of any contractor's equipment and surplus materials and remove from the site any wreckage, rubbish or temporary works no longer required. The contractor shall have designated staff who are trained and responsible for site safety and accident prevention. The contractor shall be responsible for reporting the details of any accident as soon as possible after its occurrence. The contractor is further responsible to provide appropriate equipment, tools and protective clothing to the construction workers. The contractor has to ensure that appropriate working methods are applied. For example, anti-vibration mountings and noise insulation on equipment has to be used when possible. The contractor has to provide and train workers on how to use appropriate ear protectors when noise level in the working place exceeds 85 dB.

**Traffic and Transportation Arrangements:** All operations necessary for the execution and completion of the works and the remedying of any defects therein shall be carried on so as not to interfere unnecessarily or improperly with the convenience of the public and/or access and use of public or private roads and footpaths. The contractor shall use every reasonable means to avoid traffic disruptions and to prevent any damage to roads or bridges used as transport routes.

**Work at Night and on Holidays:** Unless otherwise provided in the contract, no work shall be carried out during the night and on public holidays without prior written consent of the PMU, except where work is necessary or required to ensure safety of the facilities or for the protection of life, or to prevent loss or damage to property, when the contractor shall immediately advise the PMU.

**Public Relations:** The PMU shall announce the construction works and any new traffic arrangements during these works to the public through appropriate media (local newspapers, TV and radio) and through the ward representatives. As needed, loudspeakers can also be used during the construction work to provide the latest information to concerned areas. It is extremely important to inform the ward chairman and local residents in advance about any possible public disturbance or nuisance that may be caused by the construction works to mitigate such possible impacts.

### *7.3.2 Standards for Making Households Connections*

Based on the Final Report (January 2006) for the World Bank's Household Connections Mission, there is a recognized need to prepare project-specific standards for making household connections to the improved wastewater collection systems. Such standards are needed to ensure that when the household connections are allowed to be made, these connections will be made in a uniform manner that minimizes impact during installation and allows for proper maintenance. As described in this Final Report, these connection standards will be prepared during the project's detailed design stage by the National Consultant, working in close cooperation with the URENCO and WSSC (who will be in charge of maintaining the sewerage network) and with the Ministry of Construction and the Bank who



will need to approve the standards. It is expected that these connection standards shall provide a clear definition of:

- Agreed procedures and typical arrangement for making connections (with schematic drawings to be followed);
- Identification of possible connection points to the tertiary network (manholes, chamber or straight to pipe);
- Materials to be used, minimum and recommended pipe diameters and slopes;
- Number, placement and detailed design of any required special appurtenances (grit cambers, connection chambers, etc.).
- If the septic tanks are retained, the condition for retention should be stated.
- If the septic tanks should be abandoned, the method of abandoning should be stated.

It is expected that these connection standards shall further define the arrangements for the existing septic tanks which will become redundant facilities once the WWTP(s) are completed in Phase 2.

### *7.3.3 Specific Mitigation Measures during Dredging Activities*

The current estimate of the total volume of dredged material is 160,000 m<sup>3</sup>. Based on the results of sediment testing conducted as part of the EA in February 2006, this dredged sediment is expected to consist primarily of organic materials which could be re-used locally without further treatment for agricultural and landscaping purposes. The amount of dredged material will be clarified during the detailed design and more detailed instructions will be included in the Contract Documents. Specially, the contractors will be required to use special vehicles (tankers) for sludge transport to any off-site disposal area(s) to minimize leakage of sludge materials.

Any dredge sediments which are later found to be contaminated or not suitable for agricultural or landscaping use will be disposed of in the landfill site. Prior to disposal, the sediment can be dried out for use as covering layer at the dump site. Such disposal will need to be agreed with PMU, DONRE and the UWC. To avoid public disturbance during dredging works, the local ward chairman, residents and other concerned stakeholders will be informed in advance about the dredging schedule and work plan, including information on any proposed sludge dewatering and/or on-site storage activities.

### *7.3.4 Specific Mitigation Measures for Mine and Unexploded Ordinance (UXO) Clearance*

Because of the potential mine/UXO risk in the Dong Hoi area, arrangements will be made with Quang Binh offices of the People's Army of Vietnam (PAV) to provide adequate mine/UXO clearance services as needed during excavation and dredging works. In addition, arrangements will be made with these parties to provide adequate mine/UXO risk education (MRE) and training to the PMU, all contractors, consultants and any other field staff, as follows:

- Basic knowledge about the mine/UXO threat in the Dong Hoi sub-project areas,
- Knowledge on the official and improvised mine/UXO signs used in Vietnam,
- Knowledge about commonly used landmines and UXO that can be found in Vietnam,
- Understanding about the procedure to follow should mines/UXO be discovered.

All field staff must have received mine/UXO awareness training prior to commencement of work in the field, and be provided with refresher training at least once per year during the construction period. Coordination will be established with related on-going projects in the area prior to start of any

construction and dredging works. In Quang Binh province, in addition to GoV activities, these related projects are expected to include the US-funded National UXO/Landmine Impact Survey being conducted in partnership with the Technology Center of Bomb and Mine Disposal (BOMICEN) of the Vietnamese Ministry of Defense and MRE programs lead by UNICEF.

Steps to be Taken in when Mines/UXO Discovered during Construction: In the event that contractor work teams discover mines/UXO, the following steps shall be taken:

- a) The contractor shall immediately cease work activities within a 50 m radius of the site of the discovered mines/UXO.
- b) The contractor shall immediately notify the PMU, who in turn shall immediately arrange with the PAV or contracted party for the removal or other suitable treatment of the mines/UXO.
- c) When the mines/UXO have been suitably dealt with, PAV or contracted party shall notify the PMU in writing and accompanied by an Incident Report, or a Certificate of Clearance. The Certificate shall clearly define the area concerned and be supported by the log sheets giving details of the types of survey carried out and the types and methods of disposal of, the mines and UXO encountered.
- d) When in receipt of written notice from the PAV or contracted party and a copy of the Incident Report (Certificate of Clearance), the PMU inform the contractor in writing that works can continue in the affected area.

Safety and Medical Mitigation Measures: The contractor is solely responsible for safety of its staff and equipment, and for safety of any third person and third person's goods and properties, present on the Extended Site during execution of the Works. For this purpose, the contractor shall provide adequate medical support and casualty evacuation capacity consistent with International Mine Action Standards (IMAS) and own procedures. At a minimum, the Contractor shall ensure that:

- a) One trained medical orderly equipped with adequate first aid kit, and a vehicle fitted for carrying a stretcher (for use as a dedicated ambulance), are available to the Team when Mine/UXO Clearance is in progress; the medical orderly and the ambulance driver shall be in permanent contact with the Team leader; and
- b) The medical orderly, the ambulance driver and the Team leader know the adequate procedures for first emergency care and transport of injured personnel to hospital, as well as the location of the nearest medical facility (and the corresponding routes).
- c) Provide reliable communication means between contractor field supervisors, the Engineer, PAV or contracted party and with local medical services and facilities.
- d) Protect the drivers of machinery used for excavation and clearing from an accidental detonation. Protection should be obtained either by fitting the machinery with protective shields and/or attire the drivers with protective equipment. The minimum requirements for protective equipment are the requirements specified in IMAS. The contractor must describe the equipment and procedures to be used to protect drivers and workers in details. Furthermore a safety distance from machinery to persons not involved with the road works should be established.

#### 7.4 Mitigation Measures during Operation

##### 7.4.1 Drainage and Sewerage

During operation of the drainage and sewerage systems, the following impact mitigation measures will be applied in coordination with local community stakeholders as described in the following chapter:

- Regular visual inspections have to be made of the condition of roads where pipeline excavations are made; new drainage systems, solid waste collection equipment and services, public toilets and solid waste transfer stations. Based on these visual inspections and local reports, any possible breakages, problems or service disruptions will be reported immediately to the PMU and URENCO for repair.
- Operational and safety standards have to be followed
- Maintenance of drainage system has to be arranged; transportation of dredged material has to be done in proper means of transportation and loads have to be covered during transport to the landfill or other disposal sites; the dredged material has to be transported to the landfill or other suitable place agreed in advance with DONRE and URENCO
- Trees should be planted on embankments of the open drainage canal to strengthen these structures, reduce air pollution and to enhance the local landscape.

#### *7.4.2 Untreated discharge from Household Connections:*

The most effective mitigation measure would be to postpone the schedule for supporting household connections until the WWTPs are operational or advance the schedule for constructing WWTP to provide treatment earlier in the project period so that these project components are more closely linked.

However, if it is agreed and locally approved to allow some household connections to the combined sewer system prior to completion of the WWTPs, mitigation measures for "end of the pipe" treatments to reduce impacts and potential health risks are recommended. Connections in Phase 1 can be done at outfalls discharging to Nhat Le river, because of large river water volume and its strong water exchange. The Phong Thuy channel is already polluted at present, and it is used for irrigation during dry season. Discharging more wastewater to this channel would increase pollution expose the farmers and their families to polluted water and other public health risks. It is recommended that in Phase 1, the houses that already connected to the sewer will be allowed connecting, but there are no new house connection should be done in phase 1 for outlet 1 and 6. In general, all houses that are currently connected to the system will remain connected.

Although the characteristics and flow at the various outlets are dissimilar we are proposing the same mitigation at each outlet for the following reasons:

- The current characteristics were determined from limited sampling over a short period that did not include all the seasons. It is possible, indeed likely that these characteristics will change. Therefore we believe it is prudent to be conservative and design for the worst case. An indication of the worst case can be established by reviewing the result of all the outlets.
- If there are changes in the characteristics for even a short period a conservative design will mitigate the impact.
- The equipment for the different outlets will be standardized, parts will be interchangeable and unit cost will be reduced.

- To propose individual mitigation for what is essentially the same impact or could be the same would be tantamount to micro-managing without considering the possibility or likelihood of changes.

In both cases proposed above for outlets discharge to Nhat Le River and Phong Thuy channel.

Mitigation measures in projected areas should include:

- At outfall, manholes should be designed and constructed (overflow manhole designed in Phase 1 can be used) to input disinfections (chlorine) in order to kill pathogen bacteria. Liquid chlorine will be injected in a manhole automatically. The manhole will be designed to permit adequate mixing of the chlorine and wastewater. The liquid chlorine will be stored in plastic drums in a special building constructed for the purpose
- Placement of coarse screens on the outlets to help remove visible / floating solids.
- Increased water quality monitoring of discharge areas, public awareness programs, and signage to alert the public and tourists of any potential health risks in the effluent dispersion areas;
- Periodicly dredge of sludge in sewers and outlets

Summarized existing environmental conditions, baseline conditions, changes in baseline conditions resulting from the additional house connections and recommended mitigation are represented in table II-7.2

#### 7.4.3 *Septic Tanks:*

The majority of the septic tanks are either poorly designed, leaking, in need of major repairs or not functioning properly. If any is retained in service the long term integrity should be convincingly established by appropriate tests. This will be difficult, expensive and inconvenient. (Septic tanks are usually tested before placing in service). They will serve no useful purpose after the house connections are installed. They should be abandoned completely at the same time the house connections are made.

The procedure to be followed to abondone these tanks are:

- a) Empty the tank completely
- b) Pressure wash the inside of the tank
- c) Disinfect the inside using a strong disinfectant
- d) Punch holes in the bottom to permit future use or accumulation of water.
- e) Backfill the tank, and soak away pit with compacted sand, gravel, and/or limestone
- f) If necessary install house connection pipe through backfilled tank
- g) Test house connection for watertightness
- h) Restore ground or floor to match surrounding areas.

Table II –7.2 : Summary of environmental impacts and mitigations for temporary discharge – Dong Hoi city

Description of Outlet condition	Receiving body	Outlet 1, 6 Phong Thuy Channel	Outlet 2, 3, 4, 5, 7, 8, 9 Nhat Le River
	Hydraulic regime	- Hydrology of the channel is affected by the tide regime. - Max. depth: 3.2m	- Hydrology regime of Nhat Le river is affected by tide regime. - Daily water level varies from 1.0 to 1.2m
	Purpose of water using	- Receive storm water for the North of city - Store water for irrigation in dry season	- Receive wastewater from combined system of the city.
	Existing environmental issues	- The channel is already polluted by wastewater.	- The water of Nhat Le river near the existing outlets is slightly polluted.
BOD5 (mg/l)	Baseline	13 (*) ( Sample taken during wet season)	21.1
	Phase 1	N/A	21.58 (**)
	% increase	N/A	2.27
	TCVN 5942 : 1995 (class B)	< 25	< 25
Coliform (MPN/100ml)	Baseline	$7.2 \times 10^4$ (*)	$80.4 \times 10^3$
	Phase 1	N/A	$80.68 \times 10^3$ (**)
	% increase	N/A	0.35
	TCVN 5942 : 1995 (class B)	$10 \times 10^3$	$10 \times 10^3$
Mixing zone (km)		N/A	90m downstream from outlet (in dry season)
Mitigation measures		- The Channel will be dredged in Phase I. - Remove accumulated garbage. - Promote community awareness campaign, in which people do not throw garbage to the channel. - Install coarse screen on the outlet, remove floating solids regularly and dredge sediment in the culvert and at outlet area.	- Install coarse screen on the outlet, remove floating solids regularly and dredge sediment in the culvert and at outlet area. - Signage of the potential risk for public health near the outlets.
Recommendation		- At present, the Channel is already polluted, further more, this channel is also used for irrigation. Farmers using the water for irrigation will be exposed to the polluted water and there is a high risk of contracting waterborne diseases.	The predicted BOD5 concentration in Nhat Le river is still below the national standard, however it might be slightly higher than predicted value for individual outlets. The concentration of coliform at present is many times higher than that of national standard and it is the risk for people who are living on the river and their livelihood depends on the river. Based on the results of the model analysis a limited amount of houses can be connected to these outlets.

Note: (\*) the sample taken at the downstream of confluent between Phong Thuy channel and Nhat Le River.

(\*\*) These predictions are based on the assumption that all discharges will be made from just one outlet (due to the close proximity of the 9 outlets)

## 8 MONITORING AND REPORTING

Environmental monitoring will be done during construction at the following four (4) levels:

- Monitoring of project performance indicators;
- Monitoring of implementation of mitigation measures done by the Contractor;
- Community based monitoring; and
- Overall regulatory monitoring of the project.

### 8.1 Project Performance Indicators

A set of monitoring indicators is developed in order to assess the implementation in various project stages. These monitoring indicators are representative for characteristics of project activities and are feasible for collecting and analyzing based on the experience gained from similar Bank-funded environmental sanitation projects in Vietnam. These performance monitoring indicators will be set based on the final EA report, EMP and Project Appraisal Document (PAD) as well as the findings and recommendations of the Independent Safeguards Monitoring (ISM) Consultant to be appointed under the project. Combined with other qualitative and quantitative parameters of project performance, these indicators will be used as a tool for impact / benefit evaluation and analysis at various project stages and will be presented in reports of the PMU and ISM Consultant. The PMU will prepare to the Bank bi-annual performance monitoring reports, which will detail project progress with respect to agreed targets, including the agreed environmental project performance indicators on the following:

- Contractor compliance to impact mitigation measures and standard operating procedures (SOPs)
- Health indicators
- Flooding situation
- Wastewater and sanitation environment
- Community stakeholder participation

### 8.2 Monitoring Implementation of Mitigation Measures

Monitoring duties of the Contractor, Construction Management Consultant (CMC) and Independent Safeguards Monitoring (ISM) Consultant will be specified in their respective TORs and Contract Documents, which are subject to Bank reviews and approval. Each of these parties will be responsible for submitting monthly progress reports which will provide specific sections on environmental issues, actions and monitoring results to date. Based on these monthly reports and site visit / meeting results, the PMU will be responsible for preparing and submitting quarterly reports to the PPC, DONRE and the Bank, summarizing key environmental management and mitigation issues, results and actions to be taken. The PMU quarterly reports will include the following:

- Status of priority issues identified in last quarterly monitoring report
- Summary of progress which the Contractor has made to solve the problems
- List of issues which have not been adequately resolved and give recommendations how to solve the problems and explain force majeure

The ISM Consultant will provide needed technical assistance and guidance to each PMU and CMC to support their roles in monitoring implementation of required mitigation and reporting measures, including quantities of dredged and transported sludge materials, number of loads, type of transport, measures to keep streets clean, fencing etc.

### 8.3 Community Based Monitoring

Based on the experience gained in implementing the World bank-funded Ho Chi Minh Environmental Sanitation Project, the ISM Consultant will play a lead role in organizing local community stakeholders to participate in monitoring tertiary and household connection levels of sub-project implementation. Within each of these areas (wards), the local stakeholders, residents and businesses will be provided an orientation and invited to actively participate in the monitoring of key environmental parameters; such as water supply quality, drainage, dust, noise, air pollution and public safety. The communities would also be trained to notice the indicators and risks of environmental pollution during both project construction and operation. Based on previous experience, such monitoring can be a very important project aspect especially during the operation when the communities continue their weekly and monthly monitoring.

### 8.4 Overall Regulatory Monitoring

During the operation the related components, the URENCO (to whom the completed facilities and purchased equipment will be turned over to) will be responsible for sustaining the established air, water and sediment quality monitoring and reporting program to the DONRE and the Bank.

### 8.5 Summary of Proposed Environmental Monitoring Measures

A summary of proposed environmental monitoring measures and responsibilities to be applied during project implementation are summarized in Table II – 8.1.

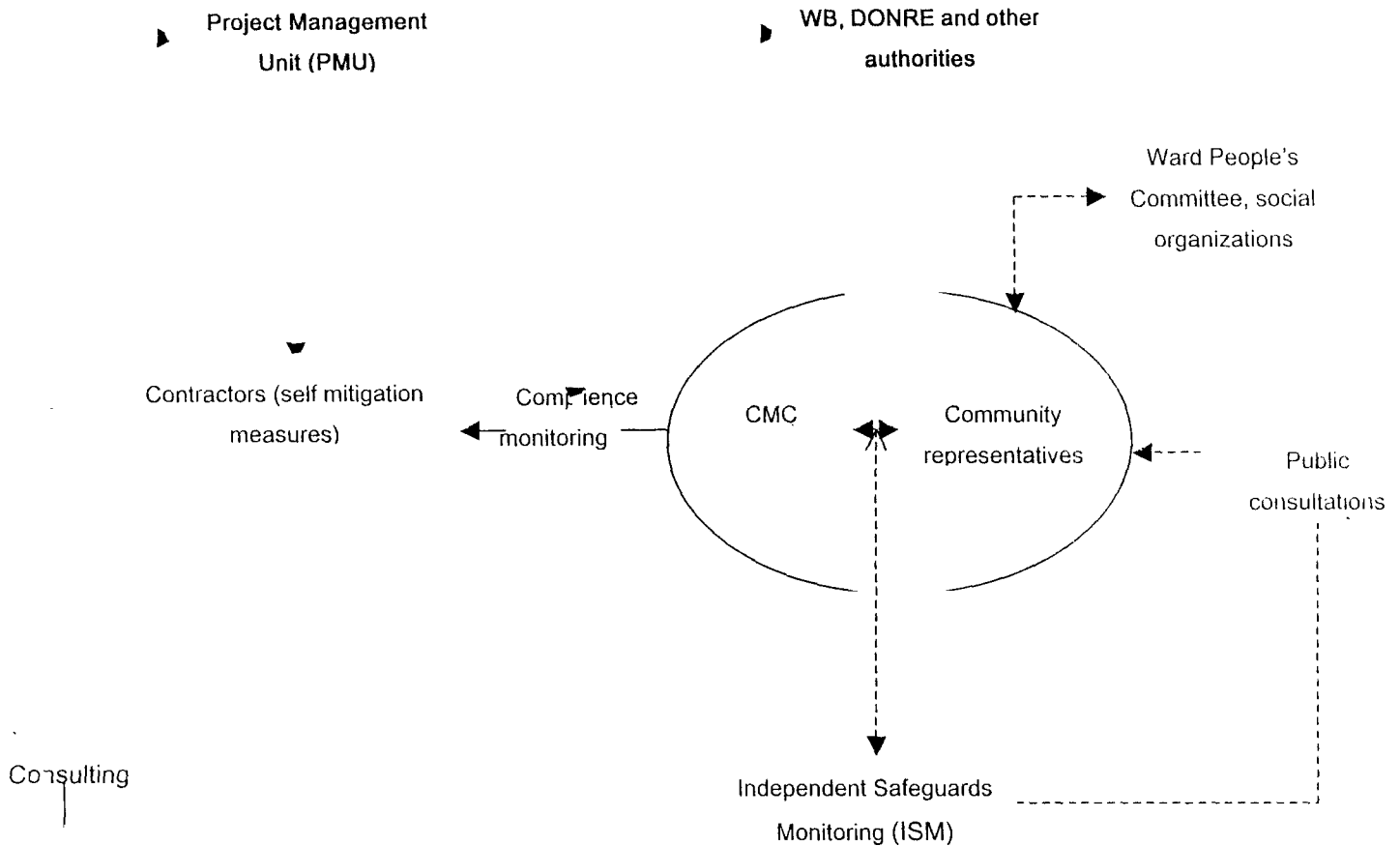
Table II - 8.1 Summary of Proposed Environmental Measures and Parameters

Performance Indicator to be Monitored	Frequency	Responsibility
Health indicators	Twice per year	PMU and related agencies
Percentage of collected solid waste	Twice per year	PMU and related agencies
Water quality: BOD <sub>5</sub> , COD, SS, coliform, total nitrogen, total phosphate, oil & grease (3 sampling points – Nhat Le River and Phong Thuy Channel)	Twice per year	ISM with assistance of Environmental Laboratory
Sediment quality monitoring: Pb, Cu, Fe (2 sampling points – dredging areas)	Twice per year	
Air quality and noise monitoring: SO <sub>2</sub> , CO, NO <sub>x</sub> , TSP, noise (3 sampling points – work areas)	In response to complaints	
Monitoring implementation of mitigation measures during construction	Monthly	CMC under ISM guidance
Community based monitoring of tertiary and household connection sub-project levels	Weekly / monthly	Communities representatives

9 PROJECT ORGANIZATION FOR ENVIRONMENTAL MANAGEMENT AND MONITORING

The proposed organization and relationship of the project's environmental management, mitigation and reporting roles and responsibilities is presented in Figure II – 9.1. Detail functions, missions and roles of concerning stakeholders in this system are described in the following sections.

Figure II – 9.1 Project Organizational Structure for Environmental Management



9.1 Project Management Unit (PMU)

The PMU has the overall responsibility to implement and monitor the EMP. Assisted by the ISM and CMC consultants, the PMU will monitor the implementation of mitigation measures during the constructor's construction works. The PMU will closely intergrate project implementation and monitoring with local People's Committtee (PC) to promote the participation and support of the community during the project planning, implementation and operation stages. The PMU is also responsible for reporting EMP implementation to the Bank and DONRE based on thier field observations, meeting results and monthly progress reports provided by the contractors, CMC / ISM consultants and community based monitors.

The environmental management and monitoring tasks of the PMU will include:

- Ensuring that all articles relating to EMP must be specified and detailed in the Bidding / Contract Documents.



- Selecting and supporting the role of the ISM Consultants to design and implement the environmental monitoring program as an integrated part of project implementation.
- Monitoring implementation of contracts of selected consultants in accordance with environmental mitigation and monitoring aspects of their TORs.
- Reviewing the contractor's proposed mobilization and work plans for possible impacts and conducting unscheduled and frequent checking of the contractors' on-site measures of environmental impact mitigation.
- Ensuring all construction monitoring consultants and public consultation experts who are assigned to support the environmental monitoring activities complete their responsibilities in accordance with their approved TORs.
- Appointing and support qualified Independent Safeguards Monitoring (ISM) Consultants to implement the monitoring services for establishing and measuring performance monitoring parameters and reporting requirements of the PMU.

### 9.2 Community Representatives

At the sub-project's tertiary and household connection levels, community representatives will be encouraged to participate in monitoring the environmental sanitation conditions in their community through their representatives to the PMU and local executive offices (PCs of wards, communes and district). Direct community involvement will take part prior to and during construction to support implementation monitoring of required impact mitigation measures and other assisting to address related community issues. These community-based monitoring measures will be supported by the project's ISM Consultant. Supported by the project's ISM Consultant, community representatives will be involved in the following monitoring measures within their respective wards:

- Participating in training courses to improve environment monitoring competence, to be developed and launched in the coordination of professional offices such as the DONRE and concerned stateholders and then will be lecturers at communities.
- Directly carrying out environmental monitoring in accordance with the agreed CEMP and specific monitoring methodologies to be developed in coordination with the ISM Consultant.
- Gathering needed baseline information to measure impact / benefits of project implementation.
- Preparing and submitting weekly monitoring reports to the PMU and concerned PCs.
- Recommending any needed adjustments or modifications in project plans and schedules to help minimize and mitigate local environmental impacts and project disturbances.
- Support the dissemination of project information, communications and awareness programs at the community level and provide feed-back on any community complaints or grievances to support needed mitigation measures for project-related environmental impacts.

### 9.3 Construction Management Consultant (CMC)

The main tasks of CMC are monitoring basic construction practices and procedures, including Standard Operating Procedures (SOPs) for mitigating environmental impacts as described in the draft EA. These tasks will be stipulated in detail in the Terms of Reference (TOR) for the CMC and

contract with the PMU, both of which are subject to Bank reviews for issuance of a No Objection Letter (NOL). Under the guidance of the PMU, the main tasks of CMC for environmental mitigation and monitoring will include but not be limited to:

- Coordinating and supporting the ISM Consultant in establishing, gathering and providing of required on-site environmental monitoring and construction implementation information.
- Ensuring that all construction work are carried out in full accordance with the approved EMP and related specifications and SOPs of the Contract Documents for mitigating and monitoring environmental impacts.
- Monitoring the implementation of the contractor's impact mitigation methods and provided any needed recommendations to improve these mitigation measures to satisfy project safeguard requirements for environmental management.
- Establishing needed contingency action plans for quickly and effectively responding to any environmental problems, emergencies and/or damages that may occur during construction.
- Recommending to the PMU the suspension of any and all construction works which do meet the agreed / contractual requirements for environmental management and public safety.
- Organizing regularly held coordination meetings with concerned stakeholders to provide needed project information, implementation schedules and work plans to enhance local awareness and to identify possible community problems and corresponding solutions prior to implementing the construction works.

#### 9.4 Independent Safeguards Monitoring (ISM) Consultant

The ISM Consultant will be responsible for detailed design of the safeguards monitoring program in accordance with regulatory and procedural requirements of the GoV and the Bank. Following reviews and approval of the safeguards monitoring plan, the ISM Consultant will be responsible for monitoring overall project implementation activities and ensuring that agreed environmental safeguard policies of the GoV and the Bank are applied and monitored through the following responsibilities:

- Ensuring that the approved EMP and all project loan agreements related to environmental safeguards are fully applied and complied during project implementation.
- Ensuring that environment impact mitigation measures are established as required for all project implementation aspects within the project's organization for environmental management system, including:
  - Establishing and implementing environmental mitigation and monitoring measures and tasks for the PMU, including estimates of budget and/or staffing requirements.
  - Assessing the effectiveness of the contractor's and CMC mitigation measures to be provided in their proposed mobilization / work plans and recommended to the PMU any needed improvements or modifications to meet the safeguard requirements.
  - Specifying to the PMU any situations that may require further detailed assessment studies and/or local consultations to determine possible impact issues and corresponding mitigation measures.

- Establishing standard procedures, methods and forms to assist the PMU and CMC to assess contractors' progress in implementing required impact mitigation and monitoring measures.
- Assisting the PMU and its' environmental mitigation and monitoring specialist to review and check detailed designs and related sections of the Contract Documents to ensure compliance with environmental safeguards and impact mitigation and monitoring requirements.
- Identifying and establishing needed baseline environmental data and CEMPs in coordination with local stakeholders (DONRE), PCEs and community representatives to support monitoring of the project's agreed performance indicators.
- Through the guidance of the PMU, establish and maintain close project coordination with the CMC to ensure that related environmental regulations, mitigation and monitoring measures and methods are clearly understood and integrated into the CMC work plan and reporting procedures, including appropriate criteria and procedures for recommending suspension of construction work when and where contractor's do not comply with agreed environmental safeguard requirements.
- Assist the CMC to prepare and to apply if required contingency action plans for any environmental damages or problems that may arise during construction.
- In coordination with the PMU and CMC, provide needed environmental management and impact mitigation assistance and guidance to the project's contractors.
- Providing needed support and assistance to community representatives in the preparation and implementation of their CEMPs.
- Assisting the PMU to establish and maintain the project's organization for environmental management, monitoring and reporting system in close coordination with concerned agencies and local communities.
- Providing requested assistance and support for the project's environmental training and capacity building programs in coordination with the PCEs.
- Support the PMU in conducting frequent on-site environmental monitoring surveys and coordination meetings with community representatives during the construction works.
- Provide general environmental guidance as requested by the PMU to enhance overall project implementation and performance.

10 CAPACITY DEVELOPMENT AND TRAINING

10.1 Environmental Training

Needed training on how to implement effective environmental monitoring, mitigation and reporting measures and systems will be provided to key stakeholders based on the actual project needs, roles and responsibilities:

PMU: Person(s) in charge of environmental issues will be trained to supervise environmental monitoring and reporting, in accordance with the Bank’s safeguards policies and GoV requirements.

Contractors: will be trained how to identify and mitigation potential impacts, including requirements and SOPs specified in their Contract Documents, how to monitor implementation of mitigation measures and how to complete monitoring reports

Workers: will be trained how to prevent pollution and environmental sanitation on the site of construction, how to respond with emergency cases.

Community representatives: will be trained on how to participate in on-site, community-based impact observing and monitoring during planning, construction and operation of sub-project components. Proposed training activities will focus on agreed monitoring measures to be observed and reported by community members, including dust, noise, tidiness of streets, frequency / duration of flooding and sanitary condition of solid waste transfer stations and public toilets.

A summary of proposed environmental training programs and recommended training participants is summarized in Table II – 10. 1.

Table II - 10.1 Environmental Training Program

	<b>PMU</b>
Course	Environmental monitoring and reporting
Participants	person(s) in charge of environmental issues and related persons to environmental management
Frequency of training	Once at the beginning of the project, updating during the implementation according to the needs
Duration and type	One day lecture
Content	<ul style="list-style-type: none"> <li>• Overall environmental management related to the project including requirements of the WB and DONRE, co-operation with related authorities and responsibilities</li> <li>• Environmental monitoring of the project including structure, content, reporting, time schedules and responsibilities of the monitoring:                             <ul style="list-style-type: none"> <li>○ project performance indicators</li> <li>○ monitoring of implementation of mitigation measures</li> <li>○ community based monitoring</li> <li>○ overall regulatory monitoring</li> </ul> </li> <li>• Guidance and supervision of the contractors and community representatives how to implement environmental monitoring</li> </ul>
Responsibility	the World Bank, DONRE, PMU, ISM
	<b>Contractors</b>

Course	Implementation of mitigation measures
Participants	Representatives of main contractors in charge of the reporting to PMU
Frequency of training	Once in the beginning of the assignment of each contractor, updating according to the needs, estimated number of contractors about 10
Duration and type	2 days lecture to the main contractors, submission of the examples of monthly environmental monitoring reports
Content	<ul style="list-style-type: none"> <li>• Briefing of overall environmental monitoring</li> <li>• Monitoring duties of the contractor according to the contract documents</li> <li>• Monthly mitigation monitoring reports: content, what and how to monitor, how to fill the reports, submission of the reports, responsibilities</li> <li>• Environmental part of the quarterly reports: implementation of mitigation measures, identified problems and solving of the problems</li> </ul>
Responsibility	PMU with the assistance of the World Bank Hanoi office

#### **Workers**

Course	Safety and environmental sanitation
Participants	Representatives of workers (group leaders) who work directly working in the project components
Frequency of training	One the beginning of the construction work, updating during the implementation according to the needs
Duration and type	One day lecture and one day on-site presentation
Content	<ul style="list-style-type: none"> <li>• Briefing of overall safety and environmental issues</li> <li>• Duties of the workers</li> <li>• Safety and environmental sanitation management on the works</li> <li>• Mitigation measures to apply on the works</li> <li>• Safety measures on electricity, mechanic, transportation, air pollution</li> <li>• How to respond with the emergency cases</li> </ul>
Responsibility	PMU with assistance of the ISM Consultant

#### **Community Representatives**

Course	On-site observing and monitoring
Participants	Team leaders of catchment drainage area
Frequency of training	Once before the beginning of the construction
Duration and type	One day lecture and one day on-site presentation
Content	<ul style="list-style-type: none"> <li>• Briefing of overall environmental monitoring</li> <li>• Duties of the communities</li> <li>• Content and type of observation during construction: water supply, drainage, dredging, roads, solid waste, dust, noise</li> <li>• Content and type of observation during operation: water supply, drainage, dredging, roads, solid waste, dust, noise</li> <li>• How to make and record on-site observations, examples on-site</li> <li>• Monthly mitigation monitoring reports: content, what and how to monitor, how to fill the reports, submission of the reports, responsibilities</li> <li>• Environmental risks during construction and operation</li> <li>• Receiving, collection and reporting of complains from the residents</li> <li>• Reporting to PMU</li> </ul>
Responsibility	PMU with the assistance of the ISM and World Bank Hanoi office

## 11 BUDGET REQUIREMENTS FOR ENVIRONMENTAL MANAGEMENT, MITIGATION AND MONITORING

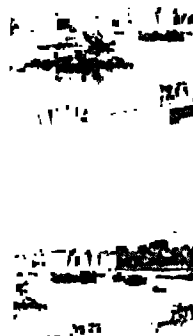
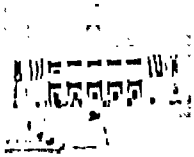
A summary of the proposed budgets for recommended environmental management, mitigation and monitoring measures is presented in Table II – 11.1, which provides the proposed budgets for each of following key EMP implementation activities:

- Environmental training
- Independent safeguards monitoring (ISM)
- Environmental monitoring by the Construction Management Consultant (CMC)
- EMP administration and management responsibilities of the PMU

Table II - 11.1 Estimated Budget Costs for EMP Implementation (in USD)

	Description	Proposed Budget	Source of Budget
1	Implementation of Mitigation Measures	Costs included in construction contracts	Loan proceeds
2	Environmental Training of PMUs, communities etc.	17,000	Loan proceeds
3	Independent Safeguards Monitoring (ISM)	23,000	Loan proceeds
4	Environmental Monitoring by CMC	Costs included in Supervision Contract	Loan proceeds
5	EMP Administration & Management by PMU	Costs included in PMU operating costs	GoV counterpart
	<b>Total</b>	<b>40,000</b>	

*Note: Proposed budget costs exclude VAT, contingency and escalation costs.*



## **ANNEX 1:**

## **List of EA Preparers and References**

### LIST OF ENVIRONMENTAL ASSESSMENT (EA) PREPARERS

#### Environmental/ Social Impact Specialists:

- Mr. Michael Ross, Environmental Specialist
- Mr. Pham Quang Phuc, Environmental Specialist
- Mr. Nguyen Minh Son, Environmental Specialist / Hydraulic modelling
- Ms. Vu Thi Thu Huong, Environmental Specialist
- Ms. Delfa Uy, Socio-Economic/ Resettlement Specialist
- Ms. Hoang Hoa, Ms. Nguyen Thi Hong Hai, and Ms. Tran Thi Mo, Sociologists

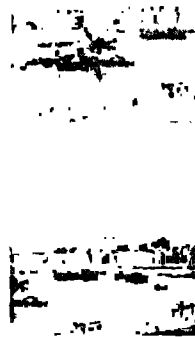
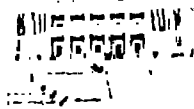
#### Technical Experts:

- Mr. Robert Binger, Team Leader CCESP International Consultants
- James Flood, Wastewater Management Expert
- Mr. Jurgen Orlich, Solid Waste Management Expert

### LIST OF REFERENCES

- 1) Adjusted General Master Plan of Dong Hoi, Quang Binh Province to 2020
- 2) Bao Ninh Peninsula Development Master Plan, 2004.
- 3) Central Region Transport Networks Sector Project, Summary IEE Report, 2005
- 4) Country Report on Land-Based Pollution in Vietnam, UNDP, 2004
- 5) Development Direction of Vietnam Urban Drainage Systems to year 2020 (MOC).
- 6) Due Diligence Review Report, CCESP International Consultant, 2006
- 7) Environmental Assessment Report on Closure of Loc Ninh Dumpsite, Dong Hoi, 2002
- 8) Environmental Assessment Report on Opening New Dong Hoi – Bo Trach Sanitary Landfill, 2002
- 9) Environmental Guidelines, CCESP International Consultants, 2005
- 10) Environmental Screening Report, CCESP International Consultants, 2005
- 11) Environmental Report, Ha Long City and Cam Pha Town Drainage and Sanitation Project 2, 2005
- 12) Environmental Profile Report of Quang Binh Province, 2005
- 13) FS on Drainage and Wastewater Collection and Treatment Project for Dong Hoi, 2003.
- 14) FS and Preliminary Design for Shared Landfill in Ly Trach, carried out by DUDP, 2002.
- 15) Pre-Feasibility Study Report for Dong Hoi CCESP Sub-Project by VIWASE, 2005
- 16) Review of Pre-Feasibility Study Report, CCESP International Consultants, 2005
- 17) Resettlement Plan (draft), Dong Hoi CCESP Sub-Project Phase 1, November 2005.
- 18) Resettlement Policy Framework (draft), VIWASE 2005
- 19) Ho Chi Minh City (HCMC) Environmental Sanitation PAD, World Bank 2001.
- 20) Province of Quang Binh Statistical Yearbook 2003, 2004.
- 21) HCMC Environmental Improvement Project – Summary Initial Environmental Examination, 2003
- 22) Household Connections Mission for World Bank CCESP, Position Paper, Nov. 2005. / Jan. 2006
- 23) Workshop Minutes for Presentation of the CCESP Pre-Feasibility Study Report, 2005
- 24) Solid Waste – Viet Nam Environment Monitor, World Bank 2004
- 25) Solid Waste Management Report, CCESP Technical Assistance, 2005
- 26) Study Report for Restructuring the Organization of Quang Binh URENCO, DUDP, 2001.
- 27) Strategy of Solid Waste Management in Vietnam Cities and Industrial Zones to 2020.
- 28) Wastewater Treatment Options Report, CCESP Technical Assistance, 2005
- 29) Wetlands Information, Viet Nam - UNEP World Conservation Monitoring Centre, 2005.





**ANNEX 2:**

**Baseline Data**

## ANNEX 2.1

**Wastewater, Water, Air and Noise Baseline Monitoring Data for Dong Hoi City (2000 – 2005) based on Annual Reports of Quang Binh Department of Natural Resources and Environment (DONRE)**

**Wastewater Quality Monitoring Data, Dong Hoi**

(Source: Annual Report on Environmental Condition of Quang Binh Province)

Location	Year	pH	SS mg/l	BOD <sub>5</sub> mg/l	COD mg/l	NH <sub>4</sub> <sup>+</sup> mg/l	PO <sub>4</sub> <sup>2-</sup> mg/l	NO <sub>2</sub> mg/l	Total Fe mg/l	Total P mg/l	NH <sub>3</sub> - N mg/l	H <sub>2</sub> S mg/l	Oil mg/l
Outlet of Dong My Phuong	2001	8.2	80	90	110	4.50	5.2	2.05	0.08	4.5	4.50	4.500	4.50
	12/2002	7.32	30	59	88					0.03	2.45	0	0.03
	6/2003	7.46	67	193	220					3.90	13.90	0.003	0.30
	12/2003	6.81	12	48	80					3.60	11.60	0.004	0.20
Outlet of Hai dinh Phuong (Ho Thanh)	12/2002	8.18	16	62	114					0.35	1.33	0	0.04
	6/2003	8.38	25	190	216					0.65	2.30	0.014	0.30
	12/2003	7.02	8	46	76					4.40	3.10	0.004	0.10
Vietnam – Cuba Hospital	12/2002	8.74	20	52	184					0.33	1.78	0.011	0.07
	6/2003	9.33	63	215	230					1.98	0.46	0.014	0.20
	12/2003	7.32	10	74	112					2.30	0.65	0.007	0.10
	6/2005	8.28	19	28	96	0.32						0.015	
Beverage Factory	6/2005	6.27	253	230	384	8.30						0.018	
	TCVN – 5945-A	6-9	50	20	50			10.0	1.00	4.00	0.10	0.200	KPH
	TCVN – 5945-B	5.5 - 9	100	50	100			15.0	2.00	6	1.00	0.500	1.00
	TCVN – 5945-C	5-9	200	100	200					8	10.00	1.000	5.00

**Wastewater Quality Monitoring Data at Factories and Enterprises, Dong Hoi**  
(Source: Annual Report on Environmental Condition of Quang Binh Province)

Location	Year	Sample	pH	SS mg/l	BOD <sub>5</sub> mg/l	COD mg/l	Turbidity	NH <sub>3</sub> mg/l	F mg/l	CN <sup>-</sup> mg/l	Zn mg/l	Cu mg/l	Mn mg/l	H <sub>2</sub> S mg/l	
Shaped Aluminum Fabrication Factory	2001	At wastewater pond	7.90		0	190	12	2.95	0.11	0.014	0.20	0.012	0.030		
		Treated Effluent	8.75		6	240	7	2.36	0.17	0.010	0.10	0.021	0.550		
	10 - 2001		8.63	55	130	170		1.27	0.40		0.01	0.010	0.001		
		12 - 2002		4.36	1530	38	200		0.17		0.001	0.60	0.024		0
	6-2003			3.95	27	32	85		19.80						0.014
		12 - 2003		6.83	3	37	88		5.80						0.002
Dong Hoi Electricity Factory CVN - 5945 (B)	12 - 2001		5.38	18	19	120		2.66		0.001	0.60	0.024			
			5.5 - 9		50	100	100	1.00	2.00	0.100	2.00	1.000	1.000		
Location	Year	Sample	Ni mg/l	Fe mg/l	Pb mg/l	Sn mg/l	Hg mg/l	Cl mg/l	Phenol mg/l	Al mg/l	SO <sub>4</sub> <sup>-2</sup> mg/l	Hardness mg/l	Oil mg/l		
Shaped Aluminum Fabrication Factory	2001	At wastewater pond	0.056	0.12	0.006	0.047	0.0027	0.063	0.007	3.97	1410	40.0			
		Treated Effluent	0.053	0.25	0.007	20.001	0.0006	0.051	0.020	0.35	5000	75.3			
	10 - 2001				0.50										
		12 - 2002			3.16									0	
	6-2003													0.10	
		12 - 2003												0.00	
Dong Hoi Electricity Factory CVN - 5945 (B)	12 - 2001			3.16									0		
			1.000	5.00	0.500	1.000	0.0050	2.000	0.050				0.05		

**Coastal Water Quality Monitoring Data, Dong Hoi***(Source: Annual Report on Environmental Condition of Quang Binh Province)*

Location	Time	pH	Temperature (°C)	Turbidity	DO mg/l	BOD <sub>5</sub> mg/l	NO <sub>3</sub> mg/l	Cl <sup>-</sup> mg/l	SS mg/l	NH <sub>3</sub> -N mg/l	Oil mg/l
At Nhat Le estuary, low tide	4/2000	7.90	25.2	18.0	6.1	8.0	3.60	11,600.00			
	5/2000	6.80	26.5	25.0	6.1	11.0	6.20	1,278.00			
	7/2000	7.80	28.1	34.0	7.0	14.0	3.08	6,745.00			
	9/2000	7.18	27.6	19.0	6.0	10.0	1.32	3,430.00			
At Nhat Le estuary, high tide	4/2000	7.91	26.8	16.0	5.8	10.0	5.50	12,900.00			
	5/2000	6.80	28.6	8.0	6.2	8.0	4.60	3,595.00			
	7/2000	7.30	28.7	28.0	7.0	13.0	5.28	6,922.50			
	9/2000	7.35	29.4	21.0	6.7	8.0	1.76	3,324.00			
At Lighthouse – Nhat Le	3/2002	8.15			5.7	26.0		12,141.00	4	0.325	KPH
	9/2002	7.61			5.5	10.0		905.25	18	0.960	0.00
	12/2002	7.80			6.3	25.0		3,231.00	5	0.630	0.00
	3/2003	8.06			6.1	28.0		14,377.00	6	1.390	0.25
	6/2003	7.88			6.1	35.0		11,661.70	10	0.850	0.10
	9/2003	8.05			5.8	35.0		12,602.00	3	0.150	0.10
	12/2003	7.31			6.3	21.0		1,455.00	4	0.300	0.00
	3/2002	8.17			5.7	14.0		11,448.00	7	0.375	0.15
At Bus station at Dong Hoi Market	9/2002	7.60			5.4	12.0		763.25	19	1.090	0.25
	12/2002	7.77			6.1	37.0		3,195.00	6	0.970	0.13
	3/2003	8.08			6.2	27.0		15,442.00	7	1.680	0.15
	6/2003	8.03			5.7	42.0		10,065.00	10	0.100	0.20
	9/2003	7.80			5.6	38.0		12,957.00	4	0.240	0.20
	12/2003	7.33			5.8	26.0		1,402.00	5	1.402	0.20
TCVN – 5943-A		6.5		< 20	≥ 4	< 4.0		-	< 25	0.100	0.00
		-8.5									
		6.5-		< 35	≥ 5	< 10		-	50	0.500	0.00
TCVN – 5943-B		8.5									
		6.6-			≥ 4	< 20		-	200	0.500	0.30
TCVN – 5943-others		8.5									

TCVN – A: Coastal water quality standard for recreation

TCVN – B: Coastal water quality standard for aquaculture

TCVN – C: Coastal water quality standard for other purposes

**Surface Water Quality Monitoring Data, Dong Hoi***(Source: Annual Report on Environmental Condition of Quang Binh Province)*

Location	Year	pH	BOD <sub>5</sub> mg/l	COD mg/l	DO mg/l	SS mg/l	Fe mg/l	Total Fe mg/l	Total N mg/l	Oil mg/l
Bau Tro Lake (center)	3/2002	7.23	25	32	6.0	7	0.09	0.50	0.090	KPH
	9/2002	7.20	9	36	5.5	12	0.21		0.125	0.0
	12/2002	7.29	16	40	6.7	8	0.12		0.130	0.0
	3/2003	6.93	17	40	6.5	9	0.07		4.000	0.0
	6/2003	7.37	20	44	6.4	9	0.04		8.500	0.0
	9/2003	7.05	15	40	5.6	17	0.20		6.250	0.0
	12/2003	7.28	11	32	6.5	11	0.09		1.800	0.0
Phu Vinh Lake	3/2002	6.96	21	32	6.4	9	0.06	2.25		KPH
	9/2002	6.73	12	38	5.5	11	0.20		0.125	0.0
	12/2002	7.47	18	32	6.5	5	0.16		0.500	0.0
	3/2003	8.03	27	35	6.6	2	0.09		2.750	0.0
	6/2003	7.03	19	47	6.7	9	0.06		8.000	0.0
	9/2003	6.49	16	40	5.2	31	0.25		7.750	0.0
	12/2003	6.49	11	32	6.7	13	0.12		2.250	0.0
	6/2005	6.68	12	24		5	0.02			
Nhat Le River (at Quan Hau)	3/2002	8.10	37	60	6.6	5	0.05	25.00		KPH
	9/2002	6.97	16	56	5.1	32	0.60		2.000	0.0
	12/2002	7.26	23	80	6.4	14	0.25		0.250	0.0
	3/2003	7.42	34	80	6.2	3	0.04		8.250	0.0
	6/2003	7.80	20	81	6.5	7	0.04		4.250	0.0
	9/2003	7.93	30	80	5.6	3	0.40		7.250	0.0
	12/2003	7.37	30	80	6.6	5	0.23		2.500	0.0
	6/2005	6.71	18	64		1	0.03			
Nhat Le river (at Nhat Le bridge)										
TCVN 5942-A		6-8.5	4	10	6.0	20	1.00			0.0
TCVN 5942-B		5.5-9	25	35	2.0	80	2.00			0.3

**Ground Water Quality Monitoring Data, Dong Hoi***(Source: Annual Report on Environmental Condition of Quang Binh Province)*

Location	Year	pH	SS mg/l	Hardness mg/l	Oxidization mg/l	DO mg/l	BOD <sub>5</sub> mg/l	NH <sub>3</sub> mg/l	Total Fe mg/l	Turbidity	NO <sub>3</sub> mg/l	CN mg/l	Cu mg/l	Zn mg/l	Pb mg/l	NO <sub>2</sub> mg/l	SO <sub>4</sub> <sup>2-</sup> mg/l	Cd mg/l	
Shallow well at Bac Ly Phuong (close to Aluminum Fabrication Factory)	10/2001	6.06	1	212	2.8	6.5	14	0	0.20										
	12/2002	5.67		85					0.32		2.75	0	0.007				18	<0.0001	
	6/2003	4.75		43					0.41		3.50	<0.001	0.010				55	0.0012	
	12/2003	5.76		42					0.39		3.30	<0.001	0.009				47	<0.0001	
From bored well at Dong Hoi Electricity Factory	10/2001	6.49		31					0.01	3	4.40	0	0.007	0.383	0				
From bored well at Aluminum Fabrication Factory	5/2001	4.39		18			17	0	0.04				0			0.017			
	12/2002	4.03		185					0.03		3.00	0	0.03				58	0.00012	
	6/2003	4.98		49					0.02		3.00	<0.001	0.01				180	0.0037	
	12/2003	6.08		47					0.03		3.20	<0.001	0.01				158	0.0029	
	6/2005	3.70							0.09						0.0031	0.006	125	<0.001	
TCVN 5944-1995		6-8.5	-	300-500	-	-	-	-	1-5		45.00	0.01	1	5.000	0.0500	-	200-300	0.010	

Note: ND – Not Detected

**Air Quality Monitoring Data, Dong Hoi**

(Source: Annual Report on Environmental Condition of Quang Binh Province)

No.	Location	Year	Unit	CO	TCVN 5937- 1995	NO <sub>2</sub>	TCVN 5937- 1995	SO <sub>2</sub>	TCVN 5937- 1995	Dust	TCVN 5937- 1995
I	<b>Dong Hoi Electricity Factory</b>	12/2001									
1	At the foot of chimney of factory		mg/m <sup>3</sup>	3	40	0.010	40.0	0.02	0.5	0.02	0.5
2	70 m far from factory's chimney (down wind)		mg/m <sup>3</sup>	6	40	0.012	0.4	0.06	0.5	0.06	0.5
II	<b>Intersection at Dong Hoi Post</b>	9/2002	mg/m <sup>3</sup>			ND	0.4	ND	0.5	0.045	0.3
		12/2002	mg/m <sup>3</sup>			ND	0.4	ND	0.5	0.039	0.3
		3/2003	mg/m <sup>3</sup>			ND		ND		0.029	
		6/2003	mg/m <sup>3</sup>			ND		ND		0.072	
		9/2003	mg/m <sup>3</sup>			ND		ND		0.028	
		12/2003	mg/m <sup>3</sup>			ND		ND		0.042	
III	<b>In front of aluminum fabrication factory</b>	6/2005	mg/m <sup>3</sup>	ND		ND		ND		0.056	
		9/2002	mg/m <sup>3</sup>			ND	0.4	ND	0.5	0.035	0.3
		12/2002	mg/m <sup>3</sup>			ND	0.4	ND	0.5	0.073	0.3
		3/2003	mg/m <sup>3</sup>			ND		ND		0.081	
		6/2003	mg/m <sup>3</sup>			ND		ND		0.043	
		9/2003	mg/m <sup>3</sup>			ND		ND		0.092	
		12/2003	mg/m <sup>3</sup>			ND		ND		0.069	
IV	<b>Me Suot Statue</b>	9/2002	mg/m <sup>3</sup>			ND	0.4	ND	0.5	0.013	0.3
		12/2002	mg/m <sup>3</sup>			ND	0.4	ND	0.5	0.023	0.3
		3/2003	mg/m <sup>3</sup>			ND		ND		0.023	
		6/2003	mg/m <sup>3</sup>			ND		ND		0.007	
		9/2003	mg/m <sup>3</sup>			ND		ND		0.012	
		12/2003	mg/m <sup>3</sup>			ND		ND		0.018	

**Noise Quality Monitoring Data, Dong Hoi,**

(Source: Annual Report on Environmental Condition of Quang Binh Province)

No.	Location	Date	Unit	Day Time	TCVN 5949	Evening	TCVN 5949	Night Time	TCVN 5949
I	<b>Vietnam – Cuba Hospital</b>								
1	Inside hospital	2000	dB	43.6	55	42.5	50	42.0	45
		3/2002	dB	42.0	50				
2	Along access road		dB	67.5	70	53.2	65	50.1	55
II	<b>Nhat Le Port</b>								
3	Center of Port		dB	55.4	75	52.0	70	42.0	60
4	Residential area west of the port		dB	55.4	65	56.2	60	46.5	50
III	<b>Intersection at Tran Hung Dao St.</b>								
5	Front of commercial company		dB	68.1	70	65.6	65	60	55
IV	<b>Hai Dinh Phuong</b>								
6	Quang Binh Quan		dB	71.5	70	61.2	65	60.1	56
7	Residential area (beside a school)		dB	53.0	65	49.5	60	44.5	50
V	<b>Dong My Phuong</b>								
	Residential area	3/2002	dB	46.0	60				
VI	<b>At front of aluminum fabrication factory</b>	3/2002	dB	48.5	75				
		9/2002	dB	61.0					
		12/2002	dB	64.6					
		3/2003	dB	64.5					

		6/2003	dB	65.7	
		9/2003	dB	65.9	
		12/2003	dB	66.2	
VII	Me Suot Statue	3/2002	dB	59.0	70
		9/2002	dB	65.0	
		12/2002	dB	62.0	
		3/2003	dB	60.0	
		6/2003	dB	62.3	
		9/2003	dB	63.3	
		12/2003	dB	65.5	
VIII	Intersection at Dong Hoi Post	3/2002	dB	60.0	60
		9/2002	dB	78.0	
		12/2002	dB	79.0	
		3/2003	dB	77.0	
		6/2003	dB	79.2	
		9/2003	dB	79.5	
		12/2003	dB	79.6	
		6/2005	dB	74.0	



## ANNEX 2.2 Copies of CCESP Water Quality Testing Results

## Summary of CCESP Water Quality Sampling Results: Dong Hoi Subproject

Sampling Site	Date	BOD <sub>5</sub> mg/l	COD mg/l	DO mg/l	SS mg/l	NH <sub>3</sub> mg/l	NH <sub>3</sub> <sup>-</sup> mg/l	NH <sub>2</sub> <sup>-</sup> mg/l	Coliform MPN/100ml
T 1	Nov. 25, 2005	15.0	32.0	6.7	16.0	0.01	2.2	0.0495	11.0 x 10 <sup>4</sup>
	Nov. 30, 2005	16.0	36.0	6.6	37.0	0.04	3.08	0.066	9.6 x 10 <sup>4</sup>
	Dec. 6, 2005	-	-	-	-	-	-	-	-
	Dec. 10, 2005	7.0	24.0	6.6	9.0	0.06	2.2	0.0858	9.8 x 10 <sup>4</sup>
	Dec. 15, 2005	-	-	-	-	-	-	-	-
	Dec. 20, 2005	-	-	-	-	-	-	-	-
	Dec. 24, 2005	-	-	-	-	-	-	-	-
	Dec. 29, 2005	18.0	36.0	6.4	20.0	0.29	2.64	0.1419	9.2 x 10 <sup>4</sup>
	Jan. 4, 2006	-	-	-	-	-	-	-	-
	Jan. 9, 2006	12.0	52.0	6.4	35.0	0.05	4.84	0.1419	2.2 x 10 <sup>4</sup>
	Jan. 13, 2006	-	-	-	-	-	-	-	-
	Jan. 18, 2006	-	-	-	-	-	-	-	-
	Jan. 23, 2006	10.0	48.0	6.4	33.0	0.04	3.52	0.0726	1.6 x 10 <sup>4</sup>
	Jan. 26, 2006	-	-	-	-	-	-	-	-
	T 2	Nov. 25, 2005	10.0	24.0	6.3	39.0	0.03	2.64	0.1221
Nov. 30, 2005		12.0	26.0	6.1	34.0	0.04	2.2	0.0495	1.2 x 10 <sup>3</sup>
Dec. 6, 2005		-	-	-	-	-	-	-	-
Dec. 10, 2005		14.0	36.0	6.1	5.0	0.21	2.2	0.5445	8.7 x 10 <sup>4</sup>
Dec. 15, 2005		-	-	-	-	-	-	-	-
Dec. 20, 2005		-	-	-	-	-	-	-	-
Dec. 24, 2005		-	-	-	-	-	-	-	-
Dec. 29, 2005		20.0	36.0	6.2	5.0	0.18	3.52	0.1617	8.9 x 10 <sup>4</sup>
Jan. 4, 2006		-	-	-	-	-	-	-	-
Jan. 9, 2006		7.0	36.0	6.3	7.0	0.18	3.96	0.2277	2.8 x 10 <sup>4</sup>
Jan. 13, 2006		-	-	-	-	-	-	-	-
Jan. 18, 2006		-	-	-	-	-	-	-	-
Jan. 23, 2006		4.0	32.0	6.2	1.0	0.18	3.96	0.0957	1.3 x 10 <sup>4</sup>
Jan. 26, 2006		-	-	-	-	-	-	-	-
T 3		Nov. 25, 2005	25.0	52.0	6.8	11.0	0.09	0.44	0.0264
	Nov. 30, 2005	60.0	92.0	6.4	43.0	0.12	4.4	0.3003	14.0 x 10 <sup>4</sup>
	Dec. 6, 2005	12.0	28.0	6.7	22.0	0.11	4.84	0.0516	18.0 x 10 <sup>4</sup>
	Dec. 10, 2005	10.0	28.0	6.4	10.0	0.19	2.2	0.1716	12.0 x 10 <sup>4</sup>
	Dec. 15, 2005	24.0	32.0	6.5	18.0	0.88	3.08	0.0693	13.0 x 10 <sup>4</sup>
	Dec. 20, 2005	26.0	36.0	6.2	5.0	0.68	4.4	0.0825	10.0 x 10 <sup>4</sup>
	Dec. 24, 2005	10.0	24.0	6.3	12.0	0.32	1.76	0.0099	9.4 x 10 <sup>4</sup>
	Dec. 29, 2005	23.0	42.0	6.5	7.0	0.42	1.32	0.0759	1.1 x 10 <sup>2</sup>
	Jan. 4, 2006	23.0	84.0	6.1	2.0	0.16	3.08	0.0693	8.0 x 10 <sup>4</sup>
	Jan. 9, 2006	18.0	76.0	6.4	45.0	0.23	3.52	0.2541	4.2 x 10 <sup>4</sup>
	Jan. 13, 2006	14.0	64.0	6.4	8.0	0.18	3.08	0.0891	2.4 x 10 <sup>4</sup>
	Jan. 18, 2006	18.0	72.0	6.4	4.0	0.05	4.4	0.1749	3.8 x 10 <sup>4</sup>
	Jan. 23, 2006	17.0	80.0	6.4	4.0	0.21	5.28	0.0396	2.3 x 10 <sup>4</sup>
	Jan. 26, 2006	16.0	76.0	6.1	9.0	0.72	4.4	0.1485	4.4 x 10 <sup>4</sup>
	T 4	Nov. 25, 2005	5.0	14.0	6.5	9.0	0.06	1.32	0.0099
Nov. 30, 2005		6.0	16.0	6.3	6.0	0.05	1.32	0.0099	9.3 x 10 <sup>2</sup>
Dec. 6, 2005		5.0	20.0	6.4	18.0	0.09	2.64	0.0033	8.6 x 10 <sup>3</sup>
Dec. 10, 2005		5.0	20.0	6.4	5.0	0.08	1.76	0.0198	6.2 x 10 <sup>2</sup>
Dec. 15, 2005		7.0	20.0	6.4	3.0	0.01	1.76	0.0033	6.8 x 10 <sup>3</sup>
Dec. 20, 2005		5.0	24.0	6.2	1.0	0.04	2.31	0.0132	5.0 x 10 <sup>3</sup>
Dec. 24, 2005		6.0	16.0	6.3	4.0	0.01	1.32	<0.001	5.8 x 10 <sup>3</sup>
Dec. 29, 2005		6.0	24.0	6.4	2.0	0.29	0.88	0.0132	5.5 x 10 <sup>3</sup>
Jan. 4, 2006		4.0	22.0	6.4	1.0	0.01	3.52	0.0264	2.6 x 10 <sup>2</sup>
Jan. 9, 2006		5.0	32.0	6.4	5.0	0.06	2.2	0.0495	2.6 x 10 <sup>2</sup>
Jan. 13, 2006		5.0	32.0	6.5	2.0	0.04	1.32	0.0165	2.4 x 10 <sup>2</sup>
Jan. 18, 2006		5.0	40.0	6.6	1.0	0.16	2.2	0.0297	1.6 x 10 <sup>2</sup>
Jan. 23, 2006		4.0	28.0	6.3	1.0	0.03	0.88	0.0099	1.5 x 10 <sup>2</sup>
Jan. 26, 2006		4.0	32.0	6.3	3.0	0.04	1.32	0.0033	1.0 x 10 <sup>2</sup>
T 5		Nov. 25, 2005	5.0	18.0	5.7	10.0	<0.01	1.32	0.0165

## Coastal Cities Environmental Sanitation Project (CCESP)

Dong Hoi

Nov. 30, 2005	6.0	18.0	5.8	5.0	<0.01	0.88	0.033	$1.4 \times 10^3$
Dec. 6, 2005	-	-	-	-	-	-	-	-
Dec. 10, 2005	5.0	20.0	6.0	8.0	0.01	1.32	0.0099	$1.2 \times 10^3$
Dec. 15, 2005	-	-	-	-	-	-	-	-
Dec. 20, 2005	-	-	-	-	-	-	-	-
Dec. 24, 2005	-	-	-	-	-	-	-	-
Dec. 29, 2005	8.0	28.0	6.3	4.0	0.06	1.32	0.363	$1.6 \times 10^3$
Jan. 4, 2006	-	-	-	-	-	-	-	-
Jan. 9, 2006	6.0	<b>44.0</b>	6.4	19.0	0.03	1.76	0.0429	$8.0 \times 10^3$
Jan. 13, 2006	-	-	-	-	-	-	-	-
Jan. 18, 2006	-	-	-	-	-	-	-	-
Jan. 23, 2006	6.0	<b>36.0</b>	6.0	1.0	0.03	1.32	0.0165	$5.0 \times 10^3$
Jan. 26, 2006	-	-	-	-	-	-	-	-
<b>National Standards (TCVN 5945: 1995)</b>								
Water quality "A" – recreational use / swimming	<4.0	< 20.0	6.0	20.0	0.05			$5.0 \times 10^3$
Water quality "B" – agricultural use / swimming	<25.0	< 35.0	2.0	80.0	1.00			$10.0 \times 10^3$

## Water Sampling Site Descriptions:

- T 1: Near outlet of Phong Thuy Channel to Nhat Le River
- T 2: Ho Thanh at outlet to Nhat Le River
- T 3: Nhat Le River at Dong Hoi Market
- T 4: Le Ky River
- T 5: Nhat Le River

BOD<sub>5</sub> - Biological Oxygen Demand (5 day)

COD - Chemical Oxygen Demand

DO - Dissolved Oxygen

SS - Suspended Sediment

NH<sub>3</sub> - Ammonia

MPN - most probable number

**CHI CỤC TIÊU CHUẨN - ĐO LƯỜNG - CHẤT LƯỢNG QUẢNG BÌNH**  
 QUANG BINH DEPARTMENT FOR STANDARDS, METROLOGY AND QUALITY

Số 609/HSMT  
 Trang số 1/1

1 Tên mẫu Nước thải 2 Ký hiệu: T<sub>1</sub>  
 3 Khách hàng Dự án vệ sinh môi trường các thành phố duyên hải  
 Địa chỉ 38 - 40 Thống Nhất, thành phố Nha Trang  
 4 Quy cách mẫu Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu  
 5 Mục đích Đánh giá  
 6 Số lượng mẫu 01  
 8 Kết quả phân tích

TT	Chỉ tiêu phân	Giá trị
1	Chất rắn lơ lửng (SS)	39
2	COD	32
3	Oxy hòa tan (DO)	6,7
4	BOD <sub>5</sub>	15
		0,095
		2,2
		0,01
		10.000

Vị trí lấy mẫu do khách hàng yêu cầu  
 Tại thời điểm lấy mẫu trước kết, công Phông thủy đang xả

Hệ thống quản lý chất lượng theo tiêu chuẩn Quốc tế ISO/IEC17025

Đông Hoi, ngày 10 tháng 12 năm 2025

Cán bộ thử nghiệm  
 Tested by: Trần Xuân Tuấn, Nguyễn Xuân Song, Phan Thanh Nghiệp

Trưởng phòng TN  
 P. CHI CỤC TRƯỞNG

Ghi chú: - Kết quả này chỉ có giá trị cho mẫu đã được kiểm tra  
 - Tên mẫu và tên khách hàng được ghi theo yêu cầu của khách hàng

**CHI CỤC TIÊU CHUẨN - ĐO LƯỜNG - CHẤT LƯỢNG QUẢNG BÌNH**  
 QUANG BINH DEPARTMENT FOR STANDARDS, METROLOGY AND QUALITY

Số 609/HSMT  
 Trang số 1/1

**CHI CỤC TIÊU CHUẨN - ĐO LƯỜNG - CHẤT LƯỢNG QUẢNG BÌNH**  
 QUANG BINH DEPARTMENT FOR STANDARDS, METROLOGY AND QUALITY

Số 601/HSMT  
 Trang số 1/1

1 Tên mẫu Nước thải 2 Ký hiệu: T<sub>1</sub>  
 3 Khách hàng Dự án vệ sinh môi trường các thành phố duyên hải  
 Địa chỉ 38 - 40 Thống Nhất, thành phố Nha Trang  
 4 Quy cách mẫu Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu  
 5 Mục đích Đánh giá  
 6 Số lượng mẫu 01  
 8 Kết quả phân tích

TT	Chỉ tiêu phân	Giá trị
1	Chất rắn lơ lửng (SS)	39
2	COD	32
3	Oxy hòa tan (DO)	6,7
4	BOD <sub>5</sub>	15
5	NO <sub>2</sub>	0,221
6	NO <sub>3</sub>	2,64
7	NH <sub>4</sub>	0,01
8	NH <sub>4</sub>	110.000

Hệ thống quản lý chất lượng theo tiêu chuẩn Quốc tế ISO/IEC17025

Đông Hoi, ngày 10 tháng 12 năm 2025

Cán bộ thử nghiệm  
 Tested by: Trần Xuân Tuấn, Nguyễn Xuân Song, Phan Thanh Nghiệp

Trưởng phòng TN  
 P. CHI CỤC TRƯỞNG

Ghi chú: - Kết quả này chỉ có giá trị cho mẫu đã được kiểm tra  
 - Tên mẫu và tên khách hàng được ghi theo yêu cầu của khách hàng

**CHI CỤC TIÊU CHUẨN - ĐO LƯỜNG - CHẤT LƯỢNG QUẢNG BÌNH**  
 QUANG BINH DEPARTMENT FOR STANDARDS, METROLOGY AND QUALITY

Số 601/HSMT  
 Trang số 1/1

1 Tên mẫu Nước mặt 2 Ký hiệu: T<sub>1</sub>  
 3 Khách hàng Dự án vệ sinh môi trường các thành phố duyên hải  
 Địa chỉ 38 - 40 Thống Nhất, thành phố Nha Trang  
 4 Quy cách mẫu Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu  
 5 Mục đích Đánh giá  
 6 Số lượng mẫu 01  
 8 Kết quả phân tích

TT	Chỉ tiêu phân	Giá trị
1	Chất rắn lơ lửng (SS)	11
2	COD	52
3	Oxy hòa tan (DO)	0,8
4	BOD <sub>5</sub>	25
5	NO <sub>2</sub>	0,0264
6	NO <sub>3</sub>	0,44
7	NH <sub>4</sub>	0,09
8	NH <sub>4</sub>	110.000

Hệ thống quản lý chất lượng theo tiêu chuẩn Quốc tế ISO/IEC17025

Đông Hoi, ngày 10 tháng 12 năm 2025

Cán bộ thử nghiệm  
 Tested by: Trần Xuân Tuấn, Nguyễn Xuân Song, Phan Thanh Nghiệp

Trưởng phòng TN  
 P. CHI CỤC TRƯỞNG

Ghi chú: - Kết quả này chỉ có giá trị cho mẫu đã được kiểm tra  
 - Tên mẫu và tên khách hàng được ghi theo yêu cầu của khách hàng

**CHI CỤC TIÊU CHUẨN - ĐO LƯỜNG - CHẤT LƯỢNG QUẢNG BÌNH**  
 QUANG BINH DEPARTMENT FOR STANDARDS, METROLOGY AND QUALITY

Số 609/HSMT  
 Trang số 1/1

1 Tên mẫu Nước mặt 2 Ký hiệu: T<sub>1</sub>  
 3 Khách hàng Dự án vệ sinh môi trường các thành phố duyên hải  
 Địa chỉ 38 - 40 Thống Nhất, thành phố Nha Trang  
 4 Quy cách mẫu Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu  
 5 Mục đích Đánh giá  
 6 Số lượng mẫu 01  
 8 Kết quả phân tích

TT	Chỉ tiêu phân	Giá trị
1	Chất rắn lơ lửng (SS)	11
2	COD	52
		0,8
		25
		0,0264
		0,44
		0,09
		110.000

Hệ thống quản lý chất lượng theo tiêu chuẩn Quốc tế ISO/IEC17025

Đông Hoi, ngày 10 tháng 12 năm 2025

Cán bộ thử nghiệm  
 Tested by: Trần Xuân Tuấn, Nguyễn Xuân Song, Phan Thanh Nghiệp

Trưởng phòng TN  
 P. CHI CỤC TRƯỞNG

Ghi chú: - Kết quả này chỉ có giá trị cho mẫu đã được kiểm tra  
 - Tên mẫu và tên khách hàng được ghi theo yêu cầu của khách hàng

**CHI CỤC TIÊU CHUẨN - ĐO LƯỜNG - CHẤT LƯỢNG QUẢNG BÌNH**  
 QUANG BINH DEPARTMENT FOR STANDARDS, METROLOGY AND QUALITY

Số 601/HSMT  
 Trang số 1/1

**CHI CỤC TIÊU CHUẨN - ĐO LƯỜNG - CHẤT LƯỢNG QUẢNG BÌNH**  
 QUANG BINH DEPARTMENT FOR STANDARDS, METROLOGY AND QUALITY

Địa chỉ: 1810, P. Đông Phú, TP. Đông Hòa, Tỉnh Quảng Bình  
 ĐT: 0262-823260, 823261  
 Fax: 0262-823260  
 Email: dqluong@qbg.vn

Số: 609/HSMT No. Trang số: 1/1 Page

**PHIẾU KẾT QUẢ THỬ NGHIỆM**  
 TEST REPORT

1 Tên mẫu: Nước mặt 2 Ký hiệu T<sub>1</sub>  
 3 Khách hàng: Dự án vệ sinh môi trường các thành phố duyên hải  
 Địa chỉ: 38 - 40 Thống Nhất, thành phố Nha Trang  
 4 Quy cách mẫu: Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu  
 5 Mục đích: Đánh giá chất lượng nước mặt tại khu vực dự án công nghệ Nhà máy xử lý nước thải thành phố Đồng Hới

6 Số lượng mẫu: 01 7 Ngày lấy mẫu: 30/11/2015  
 8 Kết quả phân tích:

TT	Chỉ tiêu	Đơn vị tính	Kết quả
1	Chất rắn lơ lửng (SS)	mg/l	34
2	COD	mg/l	20
3	Oxy hòa tan (DO)	mg/l	0,1
4	BOD <sub>5</sub>	mg/l	12
5	NO <sub>3</sub>	mg/l	0,0495
6	NO <sub>2</sub>	mg/l	2,2
7	NH <sub>4</sub>	mg/l	0,04
8	Coli10	MPN/100ml	140000

Ghi chú: - Kết quả này chỉ có giá trị cho mẫu đã được kiểm tra  
 - Tên mẫu và tên khách hàng được ghi theo yêu cầu khách hàng

STCLB/M 18.03

Đồng Hới, ngày 10 tháng 12 năm 2015  
 Trần Xuân Tuấn (Trưởng phòng TN) P. CHI CỤC TRƯỞNG  
 Nguyễn Xuân Tuấn Phan Thanh Nghiem

Hệ thống quản lý chất lượng theo tiêu chuẩn Quốc tế ISO/IEC 17025

**CHI CỤC TIÊU CHUẨN - ĐO LƯỜNG - CHẤT LƯỢNG QUẢNG BÌNH**  
 QUANG BINH DEPARTMENT FOR STANDARDS, METROLOGY AND QUALITY

Địa chỉ: 1810, P. Đông Phú, TP. Đông Hòa, Tỉnh Quảng Bình  
 ĐT: 0262-823260, 823261  
 Fax: 0262-823260  
 Email: dqluong@qbg.vn

Số: 609/HSMT No. Trang số: 1/1 Page

**PHIẾU KẾT QUẢ THỬ NGHIỆM**  
 TEST REPORT

1 Tên mẫu: Nước thải 2 Ký hiệu T<sub>1</sub>  
 3 Khách hàng: Dự án vệ sinh môi trường các thành phố duyên hải  
 Địa chỉ: 38 - 40 Thống Nhất, thành phố Nha Trang  
 4 Quy cách mẫu: Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu  
 5 Mục đích: Đánh giá Tác động Môi Trường và xác định đầy đủ các công nghệ Nhà máy xử lý nước thải thành phố Đồng Hới

6 Số lượng mẫu: 01 7 Ngày lấy mẫu: 30/11/2015  
 8 Kết quả phân tích:

TT	Chỉ tiêu phân tích	Phương pháp thử	Kết quả
1	Chất rắn lơ lửng (SS)	TCVN 4560:1988	4,1
2	COD	TCVN 6491:1999	9,2
3	Oxy hòa tan (DO)		0,1
4	BOD <sub>5</sub>		0,2
5	NO <sub>3</sub>		0,0495
6	NO <sub>2</sub>		2,2
7	NH <sub>4</sub>		0,12
8	Coli10		140000

Ghi chú: - Kết quả này chỉ có giá trị cho mẫu đã được kiểm tra  
 - Tên mẫu và tên khách hàng được ghi theo yêu cầu khách hàng

STCLB/M 18.03

Đồng Hới, ngày 9 tháng 12 năm 2015  
 Trần Xuân Tuấn (Trưởng phòng TN) P. CHI CỤC TRƯỞNG  
 Nguyễn Xuân Tuấn Phan Thanh Nghiem

Hệ thống quản lý chất lượng theo tiêu chuẩn Quốc tế ISO/IEC 17025

**CHI CỤC TIÊU CHUẨN - ĐO LƯỜNG - CHẤT LƯỢNG QUẢNG BÌNH**  
 QUANG BINH DEPARTMENT FOR STANDARDS, METROLOGY AND QUALITY

Địa chỉ: 1810, P. Đông Phú, TP. Đông Hòa, Tỉnh Quảng Bình  
 ĐT: 0262-823260, 823261  
 Fax: 0262-823260  
 Email: dqluong@qbg.vn

Số: 610/HSMT No. Trang số: 1/1 Page

**PHIẾU KẾT QUẢ THỬ NGHIỆM**  
 TEST REPORT

1 Tên mẫu: Nước thải 2 Ký hiệu T<sub>1</sub>  
 3 Khách hàng: Dự án vệ sinh môi trường các thành phố duyên hải  
 Địa chỉ: 38 - 40 Thống Nhất, thành phố Nha Trang  
 4 Quy cách mẫu: Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu  
 5 Mục đích: Đánh giá Tác động Môi Trường và xác định đầy đủ các công nghệ Nhà máy xử lý nước thải thành phố Đồng Hới

6 Số lượng mẫu: 01 7 Ngày lấy mẫu: 30/11/2015  
 8 Kết quả phân tích:

TT	Chỉ tiêu phân tích	Phương pháp thử	Kết quả
1	Chất rắn lơ lửng (SS)	TCVN 4560:1988	4,1
2	COD	TCVN 6491:1999	9,2
3	Oxy hòa tan (DO)		0,1
4	BOD <sub>5</sub>		0,2
5	NO <sub>3</sub>		0,0495
6	NO <sub>2</sub>		2,2
7	NH <sub>4</sub>		0,12
8	Coli10		140000

Ghi chú: - Kết quả này chỉ có giá trị cho mẫu đã được kiểm tra  
 - Tên mẫu và tên khách hàng được ghi theo yêu cầu khách hàng

STCLB/M 18.03

Đồng Hới, ngày 9 tháng 12 năm 2015  
 Trần Xuân Tuấn (Trưởng phòng TN) P. CHI CỤC TRƯỞNG  
 Nguyễn Xuân Tuấn Phan Thanh Nghiem

Hệ thống quản lý chất lượng theo tiêu chuẩn Quốc tế ISO/IEC 17025

**CHI CỤC TIÊU CHUẨN - ĐO LƯỜNG - CHẤT LƯỢNG QUẢNG BÌNH**  
 QUANG BINH DEPARTMENT FOR STANDARDS, METROLOGY AND QUALITY

Địa chỉ: 1810, P. Đông Phú, TP. Đông Hòa, Tỉnh Quảng Bình  
 ĐT: 0262-823260, 823261  
 Fax: 0262-823260  
 Email: dqluong@qbg.vn

Số: 611/HSMT No. Trang số: 1/1 Page

**PHIẾU KẾT QUẢ THỬ NGHIỆM**  
 TEST REPORT

1 Tên mẫu: Nước thải 2 Ký hiệu T<sub>1</sub>  
 3 Khách hàng: Dự án vệ sinh môi trường các thành phố duyên hải  
 Địa chỉ: 38 - 40 Thống Nhất, thành phố Nha Trang  
 4 Quy cách mẫu: Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu  
 5 Mục đích: Đánh giá Tác động Môi Trường và xác định đầy đủ các công nghệ Nhà máy xử lý nước thải thành phố Đồng Hới

6 Số lượng mẫu: 01 7 Ngày lấy mẫu: 30/11/2015  
 8 Kết quả phân tích:

TT	Chỉ tiêu phân tích	Phương pháp thử	Kết quả
1	Chất rắn lơ lửng (SS)	TCVN 4560:1988	4,1
2	COD	TCVN 6491:1999	9,2
3	Oxy hòa tan (DO)		0,1
4	BOD <sub>5</sub>		0,2
5	NO <sub>3</sub>		0,0495
6	NO <sub>2</sub>		2,2
7	NH <sub>4</sub>		0,12
8	Coli10		140000

Ghi chú: - Kết quả này chỉ có giá trị cho mẫu đã được kiểm tra  
 - Tên mẫu và tên khách hàng được ghi theo yêu cầu khách hàng

STCLB/M 18.03

Đồng Hới, ngày 9 tháng 12 năm 2015  
 Trần Xuân Tuấn (Trưởng phòng TN) P. CHI CỤC TRƯỞNG  
 Nguyễn Xuân Tuấn Phan Thanh Nghiem

Hệ thống quản lý chất lượng theo tiêu chuẩn Quốc tế ISO/IEC 17025

**CHI CỤC TIÊU CHUẨN - ĐO LƯỜNG - CHẤT LƯỢNG QUẢNG BÌNH**  
 QUANG BINH DEPARTMENT FOR STANDARDS, METROLOGY AND QUALITY

Địa chỉ: TK10 P. Đông Phú  
 TP. Đông Hòa - Tỉnh Quảng Bình  
 ĐT: 052 - 82376, 82361  
 Fax: 052 - 82469  
 E-mail: vlt@qbb.gov.vn

Số: 63/HISMT  
 No. **PHIẾU KẾT QUẢ THỬ NGHIỆM**  
 TEST REPORT

Trang số 1/4  
 Page.

**CHI CỤC TIÊU CHUẨN - ĐO LƯỜNG - CHẤT LƯỢNG QUẢNG BÌNH**  
 QUANG BINH DEPARTMENT FOR STANDARDS, METROLOGY AND QUALITY

Địa chỉ: TK10 P. Đông Phú  
 TP. Đông Hòa - Tỉnh Quảng Bình  
 ĐT: 052 - 82376, 82361  
 Fax: 052 - 82469  
 E-mail: vlt@qbb.gov.vn

Số: 63/HISMT  
 No. **PHIẾU KẾT QUẢ THỬ NGHIỆM**  
 TEST REPORT

Trang số 2/4  
 Page.

Hệ thống quản lý chất lượng theo tiêu chuẩn Quốc tế ISO/IEC 17025

1 Tên mẫu: Nước mặt  
 2 K. hiệu: T<sub>1</sub>  
 3 Khách hàng: Dự án vệ sinh môi trường các thành phố duyên hải.  
 Địa chỉ: 38 - 40 Thống Nhất, thành phố Nha Trang.  
 4 Quy cách mẫu: Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu.  
 5 Mục đích: ...

6 Số lượng mẫu: ...  
 8 Kết quả phân tích:

1	Chất rắn lơ lửng	mg/l	35
2	COD	mg/l	52
3	Oxy hoà tan (DO)	mg/l	6,43
4	BOD <sub>5</sub>	mg/l	12
5	NO <sub>3</sub>	mg/l	0,1419
6	NO <sub>2</sub>	mg/l	0,2277
7	NO <sub>x</sub>	mg/l	0,2541
8	BOD <sub>5</sub>	mg/l	18
9	NO <sub>3</sub>	mg/l	4,84
10	NO <sub>2</sub>	mg/l	3,96
11	NH <sub>4</sub>	mg/l	0,23
12	Coliform	MPN/100ml	22.000
13	Chất rắn lơ lửng	mg/l	8
14	COD	mg/l	64
15	Oxy hoà tan (DO)	mg/l	6,43
16	BOD <sub>5</sub>	mg/l	14
17	NO <sub>3</sub>	mg/l	0,0891
18	NO <sub>2</sub>	mg/l	3,08
19	NH <sub>4</sub>	mg/l	0,18
20	Coliform	MPN/100ml	24.000
21	Chất rắn lơ lửng	mg/l	4
22	COD	mg/l	72
23	Oxy hoà tan (DO)	mg/l	6,43
24	BOD <sub>5</sub>	mg/l	18
25	NO <sub>3</sub>	mg/l	0,1749
26	NO <sub>2</sub>	mg/l	4,4
27	NH <sub>4</sub>	mg/l	0,05
28	Coliform	MPN/100ml	38.000
29	Chất rắn lơ lửng	mg/l	33
30	COD	mg/l	48
31	Oxy hoà tan (DO)	mg/l	6,43
32	BOD <sub>5</sub>	mg/l	10
33	NO <sub>3</sub>	mg/l	0,0726
34	NO <sub>2</sub>	mg/l	0,0957

Hệ thống quản lý chất lượng theo tiêu chuẩn Quốc tế ISO/IEC 17025

1 Tên mẫu: Nước mặt  
 2 K. hiệu: T<sub>2</sub>  
 3 Khách hàng: Dự án vệ sinh môi trường các thành phố duyên hải.  
 Địa chỉ: 38 - 40 Thống Nhất, thành phố Nha Trang.  
 4 Quy cách mẫu: Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu.  
 5 Mục đích: ...

6 Số lượng mẫu: ...  
 8 Kết quả phân tích:

1	Chất rắn lơ lửng	mg/l	45
2	COD	mg/l	76
3	Oxy hoà tan (DO)	mg/l	6,35
4	BOD <sub>5</sub>	mg/l	7
5	NO <sub>3</sub>	mg/l	0,1419
6	NO <sub>2</sub>	mg/l	0,2277
7	NO <sub>x</sub>	mg/l	0,2541
8	BOD <sub>5</sub>	mg/l	18
9	NO <sub>3</sub>	mg/l	4,84
10	NO <sub>2</sub>	mg/l	3,96
11	NH <sub>4</sub>	mg/l	0,23
12	Coliform	MPN/100ml	22.000
13	Chất rắn lơ lửng	mg/l	8
14	COD	mg/l	64
15	Oxy hoà tan (DO)	mg/l	6,43
16	BOD <sub>5</sub>	mg/l	14
17	NO <sub>3</sub>	mg/l	0,0891
18	NO <sub>2</sub>	mg/l	3,08
19	NH <sub>4</sub>	mg/l	0,18
20	Coliform	MPN/100ml	24.000
21	Chất rắn lơ lửng	mg/l	4
22	COD	mg/l	72
23	Oxy hoà tan (DO)	mg/l	6,43
24	BOD <sub>5</sub>	mg/l	18
25	NO <sub>3</sub>	mg/l	0,1749
26	NO <sub>2</sub>	mg/l	4,4
27	NH <sub>4</sub>	mg/l	0,05
28	Coliform	MPN/100ml	38.000
29	Chất rắn lơ lửng	mg/l	33
30	COD	mg/l	48
31	Oxy hoà tan (DO)	mg/l	6,43
32	BOD <sub>5</sub>	mg/l	10
33	NO <sub>3</sub>	mg/l	0,0726
34	NO <sub>2</sub>	mg/l	0,0957

Cán bộ thử nghiệm: Trưởng phòng TN  
 Tested by: *[Signature]*  
 VILAS 138  
 Trần Xuân Tuấn / Nguyễn Xuân Song / Phan Thanh Nghiêm

Đồng Hoi, ngày 16 tháng 12 năm 2006  
 CHI CỤC TRƯỞNG  
 DIRECTOR: *[Signature]*

Cán bộ thử nghiệm: Trưởng phòng TN  
 Tested by: *[Signature]*  
 VILAS 138  
 Trần Xuân Tuấn / Nguyễn Xuân Song / Phan Thanh Nghiêm

Đồng Hoi, ngày 16 tháng 12 năm 2006  
 CHI CỤC TRƯỞNG  
 DIRECTOR: *[Signature]*

Bảng: Kết quả phân tích nước dự án vệ sinh môi trường các thành phố duyên hải

Ngày lấy mẫu	Chỉ tiêu phân tích	Đơn vị	Kết quả				
			T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>
04/1/2006	Chất rắn lơ lửng	mg/l	2	1			
	COD	mg/l	84	22			
	Oxy hoà tan (DO)	mg/l	6,13	6,43			
	BOD <sub>5</sub>	mg/l	23	4			
	NO <sub>3</sub>	mg/l	0,0693	0,0264			
	NO <sub>2</sub>	mg/l	3,08	3,52			
09/1/2006	NH <sub>4</sub>	mg/l	0,16	0,01			
	Coliform	MPN/100ml	80.000	260			
	Chất rắn lơ lửng	mg/l	35	7	45	5	19
	COD	mg/l	52	36	76	32	44
	Oxy hoà tan (DO)	mg/l	6,43	6,28	6,35	6,43	6,35
	BOD <sub>5</sub>	mg/l	12	7	18	5	6
13/1/2006	NO <sub>3</sub>	mg/l	0,1419	0,2277	0,2541	0,0495	0,0429
	NO <sub>2</sub>	mg/l	4,84	3,96	3,52	2,2	1,76
	NH <sub>4</sub>	mg/l	0,05	0,18	0,23	0,06	0,03
	Coliform	MPN/100ml	22.000	28.000	42.000	170	8.000
	Chất rắn lơ lửng	mg/l	8	2			
	COD	mg/l	64	32			
18/1/2006	Oxy hoà tan (DO)	mg/l	6,43	6,50			
	BOD <sub>5</sub>	mg/l	14	5			
	NO <sub>3</sub>	mg/l	0,0891	0,0165			
	NO <sub>2</sub>	mg/l	3,08	1,72			
	NH <sub>4</sub>	mg/l	0,18	0,04			
	Coliform	MPN/100ml	24.000	220			
23/1/2006	Chất rắn lơ lửng	mg/l	4	1			
	COD	mg/l	72	40			
	Oxy hoà tan (DO)	mg/l	6,43	6,58			
	BOD <sub>5</sub>	mg/l	18	5			
	NO <sub>3</sub>	mg/l	0,1749	0,0297			
	NO <sub>2</sub>	mg/l	4,4	2,2			
23/1/2006	NH <sub>4</sub>	mg/l	0,05	0,16			
	Coliform	MPN/100ml	38.000	160			
	Chất rắn lơ lửng	mg/l	33	1	4	1	1
	COD	mg/l	48	32	80	28	30
	Oxy hoà tan (DO)	mg/l	6,43	6,20	6,43	6,28	6,05
	BOD <sub>5</sub>	mg/l	10	4	17	4	6
23/1/2006	NO <sub>3</sub>	mg/l	0,0726	0,0957	0,0396	0,0099	0,0165
	NO <sub>2</sub>	mg/l					

29/12/2005	NO <sub>x</sub>	mg/l	3,52	3,96	5,28	0,88	1,32
	NH <sub>3</sub>	mg/l	0,04	0,18	0,21	0,03	0,03
	Coliform	MPN/100ml	16 000	13 000	23.000	100	5 000
	Chất rắn lơ lửng	mg/l	20	5	7	2	4
	COD	mg/l	36	36	42	24	28
	Oxy hoà tan (DO)	mg/l	6,43	6,21	6,51	6,16	6,28
	BOD <sub>5</sub>	mg/l	18	20	23	6	8
	NO <sub>2</sub>	mg/l	0,1419	0,1617	0,0759	0,0132	0,0303
	NO <sub>3</sub>	mg/l	2,64	3,52	1,32	0,88	1,32
	NH <sub>3</sub>	mg/l	0,29	0,18	0,42	0,29	0,06
24/12/2005	Coliform	MPN/100ml	92.000	89.000	110 00	5 500	1 600
	Chất rắn lơ lửng	mg/l			12	4	
	COD	mg/l			24	16	
	Oxy hoà tan (DO)	mg/l			6,28	6,28	
	BOD <sub>5</sub>	mg/l			10	6	
	NO <sub>x</sub>	mg/l			0,0099	< 0,001	
	NO <sub>2</sub>	mg/l			1,76	1,32	
	NH <sub>3</sub>	mg/l			0,32	0,01	
	Coliform	MPN/100ml			97.000	5 800	
	Chất rắn lơ lửng	mg/l			5	1	
20/12/2005	COD	mg/l			36	24	
	Oxy hoà tan (DO)	mg/l			6,21	6,21	
	BOD <sub>5</sub>	mg/l			26	5	
	NO <sub>x</sub>	mg/l			0,0825	0,0132	
	NO <sub>2</sub>	mg/l			4,4	2,31	
	NH <sub>3</sub>	mg/l			0,68	0,04	
	Coliform	MPN/100ml			100 000	5 600	
	Chất rắn lơ lửng	mg/l			18	3	
	COD	mg/l			32	20	
	Oxy hoà tan (DO)	mg/l			6,51	6,36	
15/12/2005	BOD <sub>5</sub>	mg/l			24	7	
	NO <sub>x</sub>	mg/l			0,0693	0,0033	
	NO <sub>2</sub>	mg/l			3,08	1,76	
	NH <sub>3</sub>	mg/l			0,88	0,01	
	Coliform	MPN/100ml			130 000	6 800	
	Chất rắn lơ lửng	mg/l	9	5	10	5	8
	COD	mg/l	24	36	28	20	20
	Oxy hoà tan (DO)	mg/l	6,58	6,13	6,36	6,43	5,98
	BOD <sub>5</sub>	mg/l	7	14	10	5	5
	NO <sub>x</sub>	mg/l	0,0858	0,5445	0,1716	0,0198	0,6099
06/12/2005	NO <sub>x</sub>	mg/l	2,2	2,2	2,2	1,76	1,32
	NH <sub>3</sub>	mg/l	0,06	0,21	0,19	0,08	0,01
	Coliform	MPN/100ml	98 000	87 000	120 000	620	1 200
	Chất rắn lơ lửng	mg/l			22	18	
	COD	mg/l			28	20	
	Oxy hoà tan (DO)	mg/l			6,73	6,43	
	BOD <sub>5</sub>	mg/l			12	5	
	NO <sub>x</sub>	mg/l			0,0516	0,0033	
	NO <sub>2</sub>	mg/l			4,84	2,64	
	NH <sub>3</sub>	mg/l			0,11	0,09	
26/01/2006	Coliform	MPN/100ml			180 000	8 600	
	Chất rắn lơ lửng	mg/l			9	3	
	COD	mg/l			76	32	
	Oxy hoà tan (DO)	mg/l			6,13	6,28	
	BOD <sub>5</sub>	mg/l			16	4	
	NO <sub>x</sub>	mg/l			0,1485	0,0033	
	NO <sub>2</sub>	mg/l			4,4	1,32	
	NH <sub>3</sub>	mg/l			0,72	0,04	
	Coliform	MPN/100ml			44.000	100	

## ANNEX 2.3 Copies of CCESP Sediment Quality Testing Results

**Summary of CCESP Sediment Quality Sampling Results: Dong Hoi Subproject**  
(samples collected on February 10, 2006)

Sampling Site	pH	Total Solids (%)	Total Volatile Solids (%)	Total P (%)	Cn mg/kg	Pb mg/kg	Cr mg/kg	Fe <sub>2</sub> O <sub>3</sub> mg/kg	Cu mg/kg
TB 1	6.14	-	1.91	27.5	0.62	15.2	3.75	320	18.6
TB 2	5.76	-	1.7	18.75	0.25	12.5	1.25	196	13.8
TB 3	6.24	-	3.33	31.25 <sup>r</sup>	0.875	27.5	2.5	330	22.7
TB 4	5.48	-	1.36	13.75	0.375	12.87	1.25	381	8.75
TB 5	7.75	-	1.97	25.0	0.5	12.5	0.62	224	11.24
TB 6	7.78	-	2.27	6.25	0.125	13.75	1.25	68	5.72

**International Standards (Dutch Soil Clean-up Guidelines; 1995; 1999)**

"safe" values - can be used / disposed without treatment	< 530	< 380	-	< 90
"storage" values – should be safely stored and monitored	-	-	-	90 – 190
"clean-up" values – hazardous, must be properly treated	> 530	> 380	-	> 190

## Sediment Sampling Site Descriptions:

- TB 1: Approximately 100 m from Bridge on Tran Hung Dao Road
- TB 2: In No.10 Sub – area, Dong Phu Ward
- TB 3: At outlet of combined sewer (800 mm diameter) to Phong Thuy Canal
- TB 4: Near Hospital Bridge
- TB 5: At Phong Thuy Canal near the Customs area
- TB 6: At Nam Ly Lake

P – Phosphate  
Pb – Lead  
Cr – Chromium

Fe<sub>2</sub>O<sub>3</sub> - Iron Oxide  
Cu - Copper  
Cn - Cyanide

1. Tên mẫu: Mẫu bùn 2. Kí hiệu: TB<sub>1</sub>  
 3. Khách hàng: Dự án vệ sinh môi trường các thành phố duyên hải  
 Địa chỉ: 38 - 40 Thống Nhất, thành phố Nha Trang.  
 4. Quy cách mẫu: Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu.  
 5. Mục đích: Đánh giá Tác động Môi trường và xác định dây chuyền công nghệ  
 Nhà máy xử lý nước thải thành phố Đồng Hới  
 6. Số lượng mẫu: 01 7. Ngày lấy mẫu: 10/02/2006  
 8. Kết quả phân tích:

TT	Chỉ tiêu phân tích	Phương pháp thử	Đơn vị tính	Kết quả
1	pH <sub>KCl</sub>	TCVN 5979:1995		6,14
2	Hàm lượng chì (Pb)	TC 04: 2004	mg/kg	15,2
3	Hàm lượng Crom (Cr)	TCVN 6688: 2000	mg/kg	3,75
4	Hàm lượng Cyanua (CN)	TCVN 6181:1996	mg/kg	0,62
5	Hàm lượng sắt tổng số	TCVN 4618:1988	mg/kg	320
6	Hàm lượng photpho (PO <sub>4</sub> <sup>3-</sup> )	TCVN 5256:1990	mg/kg	27,5
7	Hàm lượng đồng (Cu)	TCVN: 4572:1988	mg/kg	18,6
8	Tổng hàm lượng chất hữu cơ	TCVN 6644: 2000	%	1,91

Ghi chú: - TB1: Mẫu bùn lấy tại Sông cầu Rào gần Cầu Rào-Nam Lý.  
 - Vị trí lấy mẫu do khách hàng yêu cầu

1. Tên mẫu: Mẫu bùn 2. Kí hiệu: TB<sub>3</sub>  
 3. Khách hàng: Dự án vệ sinh môi trường các thành phố duyên hải  
 Địa chỉ: 38 - 40 Thống Nhất, thành phố Nha Trang.  
 4. Quy cách mẫu: Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu.  
 5. Mục đích: Đánh giá Tác động Môi trường và xác định dây chuyền công nghệ  
 Nhà máy xử lý nước thải thành phố Đồng Hới  
 6. Số lượng mẫu: 01 7. Ngày lấy mẫu: 10/02/2006  
 8. Kết quả phân tích:

TT	Chỉ tiêu phân tích	Phương pháp thử	Đơn vị tính	Kết quả
1	pH <sub>KCl</sub>	TCVN 5979:1995		6,24
2	Hàm lượng chì (Pb)	TC 04: 2004	mg/kg	27,5
3	Hàm lượng Crom (Cr)	TCVN 6688: 2000	mg/kg	2,5
4	Hàm lượng Cyanua (CN)	TCVN 6181:1996	mg/kg	0,875
5	Hàm lượng sắt tổng số	TCVN 4618:1988	mg/kg	330
6	Hàm lượng photpho (PO <sub>4</sub> <sup>3-</sup> )	TCVN 5256:1990	mg/kg	31,25
7	Hàm lượng đồng (Cu)	TCVN: 4572:1988	mg/kg	22,7
8	Tổng hàm lượng chất hữu cơ	TCVN 6644: 2000	%	3,33

Ghi chú: - TB1: Mẫu bùn lấy tại hồ gas công (800, đoạn đầu Lê Quý Đôn, đoạn cuối Phan Bội Châu đổ ra mương Phông Thủy)  
 - Vị trí lấy mẫu do khách hàng yêu cầu  
 - Chiều sâu tầng lấy mẫu từ 20-25 cm so với mặt tầng đáy bùn.

1. Tên mẫu: Mẫu bùn 2. Kí hiệu: TB<sub>5</sub>  
 3. Khách hàng: Dự án vệ sinh môi trường các thành phố duyên hải  
 Địa chỉ: 38 - 40 Thống Nhất, thành phố Nha Trang.  
 4. Quy cách mẫu: Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu.  
 5. Mục đích: Đánh giá Tác động Môi trường và xác định dây chuyền công nghệ  
 Nhà máy xử lý nước thải thành phố Đồng Hới  
 6. Số lượng mẫu: 01 7. Ngày lấy mẫu: 10/02/2006  
 8. Kết quả phân tích:

TT	Chỉ tiêu phân tích	Phương pháp thử	Đơn vị tính	Kết quả
1	pH <sub>KCl</sub>	TCVN 5979:1995		7,75
2	Hàm lượng chì (Pb)	TC 04: 2004	mg/kg	12,5
3	Hàm lượng Crom (Cr)	TCVN 6688: 2000	mg/kg	0,62
4	Hàm lượng Cyanua (CN)	TCVN 6181:1996	mg/kg	0,5
5	Hàm lượng sắt tổng số	TCVN 4618:1988	mg/kg	224
6	Hàm lượng photpho (PO <sub>4</sub> <sup>3-</sup> )	TCVN 5256:1990	mg/kg	25,0
7	Hàm lượng đồng (Cu)	TCVN: 4572:1988	mg/kg	11,24
8	Tổng hàm lượng chất hữu cơ	TCVN 6644: 2000	%	1,97

Ghi chú: - TB1: Mẫu bùn lấy tại mương Phông Thủy đoạn gần cầu Phông Thủy  
 - Vị trí lấy mẫu do khách hàng yêu cầu.  
 - Chiều sâu tầng lấy mẫu từ 20-25 cm so với mặt tầng đáy bùn

1. Tên mẫu: Mẫu bùn 2. Kí hiệu: TB<sub>2</sub>  
 3. Khách hàng: Dự án vệ sinh môi trường các thành phố duyên hải  
 Địa chỉ: 38 - 40 Thống Nhất, thành phố Nha Trang.  
 4. Quy cách mẫu: Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu.  
 5. Mục đích: Đánh giá Tác động Môi trường và xác định dây chuyền công nghệ  
 Nhà máy xử lý nước thải thành phố Đồng Hới  
 6. Số lượng mẫu: 01 7. Ngày lấy mẫu: 10/02/2006  
 8. Kết quả phân tích:

TT	Chỉ tiêu phân tích	Phương pháp thử	Đơn vị tính	Kết quả
1	pH <sub>KCl</sub>	TCVN 5979:1995		5,76
2	Hàm lượng chì (Pb)	TC 04: 2004	mg/kg	12,5
3	Hàm lượng Crom (Cr)	TCVN 6688: 2000	mg/kg	1,25
4	Hàm lượng Cyanua (CN)	TCVN 6181:1996	mg/kg	0,25
5	Hàm lượng sắt tổng số	TCVN 4618:1988	mg/kg	196
6	Hàm lượng photpho (PO <sub>4</sub> <sup>3-</sup> )	TCVN 5256:1990	mg/kg	1,25
7	Hàm lượng đồng (Cu)	TCVN: 4572:1988	mg/kg	1,25
8	Tổng hàm lượng chất hữu cơ	TCVN 6644: 2000	%	1,7

Ghi chú: - TB1: Mẫu bùn lấy tại sông Cầu Rào gần Cầu Bệnh viện Bắc Lý.  
 - Vị trí lấy mẫu do khách hàng yêu cầu  
 - Chiều sâu tầng lấy mẫu từ 20-25 cm so với mặt tầng đáy bùn

1. Tên mẫu: Mẫu bùn 2. Kí hiệu: TB<sub>4</sub>  
 3. Khách hàng: Dự án vệ sinh môi trường các thành phố duyên hải  
 Địa chỉ: 38 - 40 Thống Nhất, thành phố Nha Trang.  
 4. Quy cách mẫu: Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu.  
 5. Mục đích: Đánh giá Tác động Môi trường và xác định dây chuyền công nghệ  
 Nhà máy xử lý nước thải thành phố Đồng Hới  
 6. Số lượng mẫu: 01 7. Ngày lấy mẫu: 10/02/2006  
 8. Kết quả phân tích:

TT	Chỉ tiêu phân tích	Phương pháp thử	Đơn vị tính	Kết quả
1	pH <sub>KCl</sub>	TCVN 5979:1995		5,48
2	Hàm lượng chì (Pb)	TC 04: 2004	mg/kg	12,87
3	Hàm lượng Crom (Cr)	TCVN 6688: 2000	mg/kg	1,25
4	Hàm lượng Cyanua (CN)	TCVN 6181:1996	mg/kg	0,375
5	Hàm lượng sắt tổng số	TCVN 4618:1988	mg/kg	381
6	Hàm lượng photpho (PO <sub>4</sub> <sup>3-</sup> )	TCVN 5256:1990	mg/kg	13,75
7	Hàm lượng đồng (Cu)	TCVN: 4572:1988	mg/kg	8,75
8	Tổng hàm lượng chất hữu cơ	TCVN 6644: 2000	%	1,36

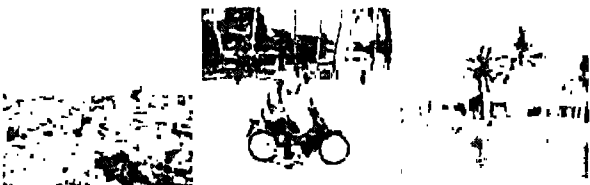
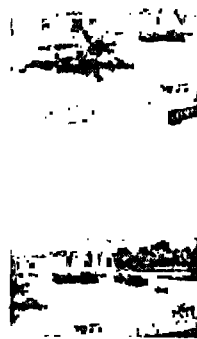
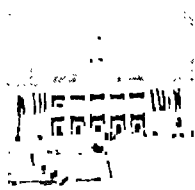
Ghi chú: - TB1: Mẫu bùn lấy tại mương Phông Thủy đoạn gần cầu bệnh viện  
 - Vị trí lấy mẫu do khách hàng yêu cầu  
 - Chiều sâu tầng lấy mẫu từ 20-25 cm so với mặt tầng đáy bùn

1. Tên mẫu: Mẫu bùn 2. Kí hiệu: TB<sub>6</sub>  
 3. Khách hàng: Dự án vệ sinh môi trường các thành phố duyên hải  
 Địa chỉ: 38 - 40 Thống Nhất, thành phố Nha Trang.  
 4. Quy cách mẫu: Chi cục Tiêu chuẩn - Đo lường - Chất lượng lấy mẫu.  
 5. Mục đích: Đánh giá Tác động Môi trường và xác định dây chuyền công nghệ  
 Nhà máy xử lý nước thải thành phố Đồng Hới  
 6. Số lượng mẫu: 01 7. Ngày lấy mẫu: 10/02/2006  
 8. Kết quả phân tích:

TT	Chỉ tiêu phân tích	Phương pháp thử	Đơn vị tính	Kết quả
1	pH <sub>KCl</sub>	TCVN 5979:1995		7,78
2	Hàm lượng chì (Pb)	TC 04: 2004	mg/kg	13,75
3	Hàm lượng Crom (Cr)	TCVN 6688: 2000	mg/kg	1,25
4	Hàm lượng Cyanua (CN)	TCVN 6181:1996	mg/kg	0,125
5	Hàm lượng sắt tổng số	TCVN 4618:1988	mg/kg	68
6	Hàm lượng photpho (PO <sub>4</sub> <sup>3-</sup> )	TCVN 5256:1990	mg/kg	6,25
7	Hàm lượng đồng (Cu)	TCVN: 4572:1988	mg/kg	5,72
8	Tổng hàm lượng chất hữu cơ	TCVN 6644: 2000	%	2,27

Ghi chú: - TB1: Mẫu bùn lấy tại Hồ Nam Lý - Sưu Trữ sở Phông Nam Lý.  
 - Vị trí lấy mẫu do khách hàng yêu cầu  
 - Chiều sâu tầng lấy mẫu từ 20-25 cm so với mặt tầng đáy bùn





## ANNEX 3

## Public Consultation and Disclosure

**Annex 3.1: Summary Results from the Conducted Socio-economic Survey and Household Consultations, Dong Hoi (September - October 2005)**

Responses to CCESP Socio-Economic Survey	Total Number of Responses	% Total Respondents	Number of Responses from Poor Households	% of Poor Respondents
<b>Question #10. Where do you dispose of your own domestic waste water ?</b>				
<b>Question #10a. Domestic wastewater (eating, drinking, washing and bathing)</b>				
Into the city's sewerage and drainage system	74	24.7	19	13
Into primary drainage system then to the pond/ lake/ river	29	9.3	10	6.8
Into pond/ lake/ canal/ sea	4	1.3	1	0.7
Into the garden	133	44.3	77	52.7
Absorb into land/ into hole	61	20.3	39	26.7
Others				
<b>Question #10b. Wastewater from business and services</b>				
Into the city's sewerage and drainage system	5	27.8	1	20
Into primary drainage system then to the pond/ lake/ river	11	61.1	3	60
Into the garden	2	11.1		
<b>Question #11. Please describe the sewage and drainage system in your living area</b>				
To excavated earth drain / channel (no masonry)	44	14.7	30	20.5
To public masonry drainage system which flows to pond / lake / river	25	8.3	11	7.5
To City's combined sewer system (masonry)	68	22.7	16	11
Liquid wastes are disposed onto the land / into hole	210	70	122	83.6
Liquid wastes are disposed directly to the sea	19	6.3	8	5.5
<b>Question #12. In the rainy season, does the area you live in flood ?</b>				
Yes	79	26.3	40	27.4
<b>Question #13. If yes, how long has the flooding last for ?</b>				
Half day	53	31.9	25	32.9
1 day	22	13.3	8	10.5
2 days	11	6.6	3	3.9
3 days	55	33.1	27	35.5
Others	25	15.1	13	17.1

**Question #14. According to you, what are most serious environmental issue(s) that need to be addressed in your community?**

Lack of sewage & drainage system	172	57.3	92	63
Flooding during rainy season	152	50.7	70	47.9
Pollution by wastewater	93	31	53	36.3
Air pollution by exhusts or dust	24	8	0	
Lack of hygienic sanitation	41	13.7	27	18.5
Disorderly scattered waste or rubbish	30	10	16	11
Daily water pollution from underground/ river / canal	19	6.3	13	8.9
	<b>539</b>		<b>273</b>	

**Question #32. How do you manage / dispose of the solid waste from your household ?**

Wastes are disposed in the main street	1	0.3		
Gathering to the public dustbin every day	85	28.3	30	20.5
Waste is being collected by waste collectors	204	68	106	72.6
Wastes are stored for 2-3 days, then publicly collected	1	0.3	1	0.7
Wastes are burned / buried	9	3	8	5.5

**Question #35. Does your family segregate its solid waste before it is disposed ?**

Yes	14	4.7	10	6.8
No	285	95	136	93.2

**Question #36. In your opinion, should you segregate your wastes before it is disposed ?**

<b>Yes</b>	149	49.7	61	41.8
Yes, because it is easy to segregate the wastes for recycling or composting	31	20.8	12	19.7
Yes, because it saves the organic wastes for fertilizer	28	18.8	13	21.3
Yes, because is it good for the environment and sanitation	133	89.3	53	86.9
Yes, others	1	0.7	1	1.6
<b>No</b>	151	50.3	85	58.2
No. because waste of time	88	58.3	52	61.2
No, because we do not know how to segregate waste	119	78.8	67	78.8
No, because disposed wastes do not affect the environment	4	2.6	3	3.5
No, others	1	0.7		

**Question #44. In the last month, did any of your family members get sick from an illness that is related to environmental sanitation ?**

Yes	179	59.7	99	67.8
-----	-----	------	----	------

**Question #49. What benefit(s) do you expect to have if investments are made in your area to build sewage and drainage systems and improve rubbish collection?**

Improved health conditions	288	96	141	96.6
Cleaner environment	239	79.7	104	71.2
More convenient living and working conditions	233	77.7	126	86.3
Reliability	118	39.3	59	40.4
	<b>880</b>		<b>432</b>	

**Question #50. Do you think that it is necessary for your household's domestic sewage to be connected to the city's common sewage and drainage system ?**

Domestic sewage (yes)	294	99	142	98.6
Toilet sewage (yes)	291	99	141	98.6

**Question #51. Do you think your family can afford to connect to a new sewage system or improvement to the city's sewage and drainage system ?**

Yes	90	30	55	37.7
-----	----	----	----	------

**Question #52. How much are you willing to pay to connect your household to the city's common sewage and drainage system?**

0	13	5.6	1	0.8
< 200,000 VND	17	7.3	10	8.3
200,000 - 500,000 VND	173	74.2	98	81.7
> 500,000 VND	29	12.4	11	9.2

**Question #54. If you answered "no" to Question # 51, what is the reason why ?**

We can not afford it	41	24.7	22	32.8
We do not want to connect it	2	1.2	1	1.5
We have a proper sewage system already	44	26.5	12	17.9
Our system had already been connected to city's combined	28	16.9	8	11.9

**Question #55. How much are you willing to pay for monthly wastewater collection service ?**

< 5,000 VND	273	91	142	97.3
5,000 -10,000 VND	23	7.7	3	2.1
> 10,000 VND	1	0.3	1	0.7

**Question #55.3. Which payment method is convenient to your family?**

Every month	131	44	58	40
Every 3 months	131	44	58	40

Every 12 months	2	0.7		
-----------------	---	-----	--	--

**Question #56. In your opinion, how often should fees for wastewater collection be increased?**

Increase 5% yearly compared with initial price	7	2.3	1	0.7
Increase in price after 3 years	28	9.3	13	8.9
Increase in price after 5 years	225	75	123	84.2
Others	40	13.3	9	6.2

**Question #57. Are you interested and willing to have a sanitary waste collection service in your area ?**

Yes	225	75	112	76.7
-----	-----	----	-----	------

## ANNEX 3.2

## 1 SUMMARY OF FOCUSED GROUP DISCUSSIONS AND CONSULTATIONS

## I. Objectives:

\* Evaluate the current socio-economic condition of households, including detailed following:

- The current demographic condition of households, income and expenditures of households.

Percentage comparison of expenditures of activities against those of drainage and sanitation in a household.

- The existing condition of households' water supplies and water-closet.
- The existing condition of households' domestic drainage system and public drainage.
- The current public health, especially transmissible diseases.

\* Study the demand of various economic communities of sanitation services, capital and payment capacity, acceptable capacity of service. Detailed objectives includes:

- Possibility of connection the domestic drainage and the system of effluents from households with public drainage system of city. Possibility of participation of community in project's activities.

- Capacity of capital and payment for the public drainage system connection.

- Possibility of acceptance, choices of sanitary services and possibility of choices of payment methods related to future sanitary services.

- Impacts of project on the life of community.
- Reasons of households that want or don't want to join the project.
- Recommendation of community to the project.

## 2. Participants:

Number of Focused Group Discussions, Group Consultations and In-depth Interviews with  
Community Leaders and Members from Project-Affected Wards in Dong Hoi City

Date	Type / Focus of Meeting	Male	Female	Total
Oct. 11	Leader group discussion of Hai Dinh Ward	9	6	15
	Community group discussion of Hai Dinh Ward	8	5	13
	Leader group discussion of Bac Ly Ward	8	3	11
Oct. 12	Leader group discussion of Dong Phu Ward	11	6	17
	Leader group discussion of Dong My Ward	7	5	12
	Community group discussion of Bac Ly Ward	6	4	10
	<b>Total for Dong Hoi</b>	<b>49</b>	<b>29</b>	<b>78</b>
8-Oct	Training of Dong Hoi household surveyors		10	10

## 3. Results of focused group discussions

## General information about 4 wards:

Final Environmental Assessment

Annex 3 - 1.5

Annex 3: Public Consultation and Disclosure

1. Dong My Ward: It has fair – average economy, near the central of the city:

- Total of households: 649HHs, with 7 sub-areas.
- The rate (%) of poor households (< 260,000 VND/person/month) according to criteria of Social Labor and Disability Ministry in 2005 :3 households, occupied 0.46% at the present.

2. Bac Ly Ward: far from central of city, representative of poor wards. Households' income is mainly from agriculture.

- Total of households: 2,963 HHs, with 15 sub-areas.
- The rate (%) of poor households ( < 260,000 VND/person/month) according to criteria of Social Labor and Disability Ministry in 2005: 76 households, occupied 2.5%.

3. Hai Dinh Ward: near central of city, representative of wealthy wards

- Total of households: 833 households, with 4 sub-areas.
- The rate of poor households ( <250,000 VND/capita/month) according to criteria of Social Labor and Disability Ministry in 2005: 6 households, occupied 0.72%

4. Dong Phu Ward: relatively far from central of city, representative of wards with average economy.

- Total of households: 1,929 households, with 10 sub-areas.
- The rate of poor households (< 260,000 VND/capita/month) according to criteria of Social Labor and Disability Ministry in 2005: 48 households, occupied 2,5%.

General information of existing condition of flooding in rainy season in 4 wards:

*( From: The discussion of leaders of 4 wards)*

1. Dong My ward:

- Most households on Duong Van An street is flooded in rainy season because of without drainage system.
- Sub-area 1: Phan Chu Trinh street with 10 households
- Sub-area 2: Duong Kiet area with 10 households, no drainage system
- Sub-area 3: Nguyen Duc Canh street with 10 households, no R3 system
- Sub-area 4: Duong Van An street with 16 households and 10 households on Ho Xuan Huong Street.
- Sub-area 5: Cao Ba Quat street with 5 households, Duong Van An street with 10 households.
- Sub-area 6: Duong Van An street with 10 households, parks ponded, no drainage system.
- Sub-area 7: Duong Van An street, Cao Ba Quat street with 20 households, Nguyen Thanh Quan is flooded locally, the routes near Petrol Station with 3 households, no drainage system.

2. Bac Ly ward:

- Almost sub-areas of ward currently has not drainage system, therefore flooded situation in rainy season is obvious, and duration of water for drainage is one or two weeks
- The current sub-areas has not been polluted by water such as sub-areas No 1, 3, 5, 9 and 10
- Sub-areas has been polluted and flooded by water such as sub-areas No 4,6,7,8,12,11,14,15. Most of them has no drainage system and are affected by industrial wastewater from Quang Binh's factories, Tay Bac industrial zone, Union market, Bac Ly market. On the routes of Highway 1, there is about 120 households without drainage system in rainy season. Duration of water drainage is usually about 1 week. Along the routes F325 is the same, it is usually overflowed.

### 3. Hai Dinh ward:

#### Sub-area I:

- Huong Giang street with 20 households is usually flooded in rainy season. On Huynh Con street, poor people gather to live here. But it has not equipped drainage system leading to severe environmental pollution.
- On Thanh Nien street, Pham Tuan street, there are 20 households, it takes one or two weeks for water drainage after rain.

#### Sub-area II:

- Hung Vuong street crossing with Tax branch area has also been flooded, rainwater drainage takes 2 days after heavy rain.
- The area of Thanh Nien street crossing with Nguyen Trai street, next to primary school and pre-school has 8 households. There has been no drainage system at presents. This area concentrates mainly administrative offices of ward.

#### Sub-area III:

- Nguyen Huu Huan street bordering on Le Loi street is the most severely flooded for a whole week if there is heavy rain, it is always in wet condition. Wastewater from households has been released on this street.
- Around area of Quang Binh Quan including well-off households and administrative offices, is also in flooded condition during heavy rain.
- The central area of Nguyen Trai street is poor area and also flooded when it has heavy rain.

#### Sub-area IV:

- On Nguyen Huu Canh street, there are 30 households. This street is flooded for three or four days after rain. The area near the bridge with 20 households is flooded for 1 week caused by overflow of river while the surface of the street is lower than level of water.
- Some of households in Quang Trung street is in the same condition.



ANNEX 3.3 List of Participants in 2<sup>nd</sup> Public Consultation for Dong Hoi EA (held Dec 27, 2005)

## THÀNH PHẦN

Tham gia Hội nghị tham vấn cộng đồng  
 Dự án Vệ sinh môi trường thành phố Đông Hới  
 Đông Hới, ngày 27, tháng 12 năm 2005

STT	HỌ VÀ TÊN	ĐƠN VỊ
1	Ban chuẩn bị TP Đông Hới	Ban chuẩn bị địa phương
2	Lê Minh Tuấn	KS MT nước - Ban CBDA
3	Nguyễn Quang Hoàn	pet UBND phường Đông Mỹ
4	Lai Thị Kim Loan	CT Hội phụ nữ Đông Mỹ
5	Đặng Thị Nguyệt Nga	phường Đông phố
6	Trần Kiều Trang	phường Đông phố (Trạm y tế)
7	Ngô Diễm Dương	phường Đông phố (Hội phụ nữ)
8	Phạm Thị Như Ý	phụ nữ Đông Mỹ
9	Ngô Tấn Nhock	phụ nữ Đông phố (TK 8)
10	Phạm Văn Mai	phụ nữ Hải Bình (Trạm khu 2)
11	Hoàng Ngọc Quý	Trạm Khu 1 Hải Bình
12	Võ Xuân Trường	ĐD Địa phương & ĐC
13	Hà Văn Hải	ĐD Công ty Công trình đô thị Quảng Bình
14	Hà Văn Xuân	TK 4 Hải Bình
15	Hà Thị Hải Châu	phụ nữ phường Hải Bình
16	Lê Thị Hồng Hoa	Trạm y tế Đông Mỹ
17	Hồ Văn Thuận	Trạm Khu 2 phường Đông Mỹ
18	Ngô Thị Oanh	Trạm Khu 1 Hải Bình
19	Hoàng Tiến	Hải đảo UBND phường Hải Bình
20	Trần Văn Sơn	Hải đảo Sơn TN M Trường
21	Đỗ Thị Anh Tuyết	Trạm y tế phường Hải Bình
22	Trần Thị Ngọc Bích	Đông Hải phường
23	Nguyễn Thị Thuận	phường Đông Mỹ

Total number of participants from local authorities, PMUs of related projects, VIWASE: 3 persons,

Total number of participants from project affected areas: 17 persons

English Translation of Minutes of the December 27, 2005 Public Consultation  
on the Dong Hoi Draft EA

Time: From 830 to 1100

Venue: Floor 4, Conference Room of Dong Hoi Construction Department  
59 Ly Thuong Kiet, Dong Hoi city, Quang Binh Province

Participants:

- Representatives of PPU;
- Representatives of International Consultant;
- Representatives of DONRE;
- Representatives from Swiss Agency for Development and Cooperation (SDC) Dong Hoi Urban Development Project (DUDP)
- Representatives from the People Committee and Women's Union of project affected wards: Hai Dinh, Dong Phu and Dong My
- Representatives of project-affected households in wards of Hai Dinh, Dong Phu and Dong My

Content:

After the presentation of PPU and representative of International Consultant on the objective of the public consultation, project activities and brief content of the draft EA Report, group discussion was carried out. Participants were divided into 3 groups under ward category, including Hai Dinh, Dong Phu, and Dong My wards. Group discussion focused on following questions:

1. In your opinion, are there any environmental problems additional to those presented in the report prepared by International Consultant?
2. In your opinion, what are disadvantageous and advantageous impacts on your living environment caused by project's activities?
3. Do you have any recommendation in terms of environmental issue during project implementation?

*Results of Group Discussions:*

Hai Dinh group:

Generally, we agree with proposed project's activities. However, we have some following recommendations:

- In terms of finance, do we have to contribute anything to sub-project's budget?
- In phase I, drainage systems in all 3 wards will be upgraded. It also means that many roads in this area will be dug up, affecting the transportation of inhabitants. Therefore, we recommend the project should be carried out in dry season.
- Many roads in our ward are usually flooded. Thus, during the project implementation, these roads should be checked and a solution should be found out to solve this situation thoroughly.
- The sanitary situation in our ward will be better if the project is to be carried out in a good manner. Otherwise, it will make the situation worse. If the improvement of drainage systems is patchy or

unsystematic, the drainage systems in this area will be never completed and always in a patchy situation. And therefore the project's objective couldn't be met.

- Will drainage systems in the inner area be renewed? If the drainage systems are just upgraded, they can not meet the sustainability of the project? If they are renewed, how are they renewed and how can the implementation of project guarantee sanitary situation and not affect to transportation of inhabitants?
- If current drainage systems are renewed, where will waste water from households discharge?
- The process of project implementation should be synchronous. Materials dredged from drainage systems and channels should be cleared away quickly and thoroughly. If the project affecting to public constructions, they should be restored as soon as possible without requiring the contribution from inhabitants.

Mr. Tuan, representative from PPU answered queries of the Hai Dinh group:

- This project is funded by World Bank and the State Budget. People are beneficiaries. In general, they do not have to contribute anything to the budget. However, in some cases, the city and project will consider very carefully if they have to contribute a very small amount.
- In terms of your reflection on some inundated roads, we will check these roads again and have solution to solve the situation.
- Regarding your recommendation on patchy improvement: some drainage systems will be built up, some will be upgraded from existing systems.

Dong My group:

- There are enough drainage systems in Dong My ward, but they are unqualified. Manholes of R1 and R2 systems (preliminary and secondary systems) do not have screens or screens have been placed inaccurately resulting in the blockage and inundation.
- R3 system (tertiary system) was constructed in a bad manner so that it has been degraded quickly. Stink release from untreated wastewater flowing through this system causes seriously environmental pollution.
- In accordance with the report, 50% of solid waste is collected. However, they are in fact mainly gathered by scavenger and recycler dealers. There is no official procedure in terms of classifying solid waste launched by the city. There have no separated dustbin for solid waste.
- There should have rational policy for each ward. For example, 100% of household in Dong My ward have septic tank. Thus, we recommend that it is more rational if revolving fund is used for upgrading R3 system.
- The project should promote dissemination activities on project's activities and project implementation to local people.
- We all agree with positive impacts indicated in the report. However, in our view, there are also some negative impacts caused by the project:
  - o The pavements in Dong My ward have just been renewed by our contribution. So who will pay for the restoring, if they are now again excavated to upgrade or construct new drainage systems?

- If materials dredged and dug from channels and roads are not treated well, they will pollute surrounding environment, affecting seriously to people's life in the area.
- Our recommendations:
  - A waste water container should be built and waste water will be treated here before it discharging to river.
  - Manholes should be treated to annul the stink;
  - The project should cooperate with relevant authorities such as departments of electricity, water and transportation in order to avoid digging up roads repeatedly.
  - A measure to collect wastes should be worked out to solve the situation that rubbish and waste are stagnant in the city.

Ms. Huong, representative from International Consultant, answered queries of Dong My group:

- We will be in cooperation with Local Consultant to find out the solution to solve the stink caused by unqualified manholes.
- In terms of using revolving fund, we acquire your idea but we do not promise that it will be used in your proposed way.

Dong Phu group:

We have some additional recommendations to the project as below:

- In phase I, a waste water container should be built in addition to the existing container of the city in Duc Ninh. A wastewater treatment plant should be built in each ward and waste water from residential areas will discharge to this plant. Waste water treated in this plant will then discharge to the shared container.
- Apart from R1 and R2 channels, the project should have specific investment plan for households located along R3 channel.
- Infrastructure in Dong Phu ward is not yet built synchronously. At present, drainage system of Dong Phu ward has not yet been invested in. Therefore, we request the project invest in this item.
- Regarding waste collection, 90% of household waste has been collected presently. However, industrial waste (i.e. construction materials) is not yet gathered adequately. Thus, we recommend that there should have landfill for this kind of materials.
- The project should have location to treat solid waste.
- In terms of project's impacts on living environment in Dong Phu ward, we all agree with positive impacts indicated in the report. However, we recommend that the project should be implemented synchronously and thoroughly in each residential area.
- Cau Rao river and Phong Thuy channel run across the ward. In fact, their width is rather narrow, not enough for water to discharge causing inundation in rainy season. Therefore, we recommend that Phong Thuy and Muoi culvert (in ward of Duc Ninh, Dong Phu and Hai Dinh) should be repaired and upgraded.
- Land acquisition to widen Cau Rao river and waste water container will narrow cultivated area detrimental to livelihood of local people.
- The project should adhere to current master plan on transportation of the city to avoid overlapping other projects.

- Phase I will be carried out from 2006 to 2011. During this time, there should have temporary drainage system to discharge waste water from households in project area. Recommendations:
  - o The project should have adequate compensation for land acquisition (including residential and cultivated land as well as constructions affected by the project) in order to create favorable conditions for local people to recover from project's impacts.
  - o The project should have a investment in dredging existing channels and maintaining these channels after the completion of project.

PPU:

- Wastewater from households should connect to the city's sewage systems.
- In phase 1, the wastewater from households which have septic tank should connect to the combined system.
- In phase 2, the wastewater should connect directly with sewage system.
- The wastewater from industrial factories and hospitals should be preliminarily treated before connecting to the city's sewage system.

**Quang Binh Urban Works Company (UWC):**

- The wastewater from households connects directly to sewers in separate system is a good practice, but it is necessary to have a measure to avoid reverse odor from sewage to house.
- The dredged material from rehabilitated waterways in Cau Rao river, Phong Thuy channel and Nam Ly lake could be used for levelling, the areas will be located by Quang Binh Department of Construction, the rest of this material will be disposed at new landfill site.

**Dong Hoi Urban Development Project (DUDP):**

- The household connection in Dong Hoi might be difficult because in some areas, the existing level of houses is much lower than that of main streets.
- In case wastewater from households connects directly to sewage system, the slope of sewage should be designed so that to ensure self-cleaning condition. To match the above condition, it is possible to increase the number of wastewater pumping stations due to flat topography of Dong Hoi, lead to high operation cost.
- The necessity of household connection in phase 1 depends on a detail calculation of waste loading, waste dilution in receiving water bodies.
- It should use dredger in dredging Cau Rao river and convey the dredged material to leveling area through pipe.
- The main concern of displaced people who are cultivating shrimp along Cau Rao river is how to recover their income and to create jobs. These people might wish to resettlement by themselves. At the moment, quantity of hazardous and industrial waste in Dong Hoi is small. In future, the hazardous waste will be disposed in separate area within the new landfill.

ANNEX 3.4: Summary Results of Questionnaire Survey conducted February 25, 2006 for 20 Households near Proposed Phase 1 Discharge Outlets

Survey No.	Name of household head	Outlet No.	Distance from HH to outlet (m)	Existing Environmental Problems in Respondents' Area						
				Polluted by traffic (dust, noise, air emissions)	Pollution from open channel	Flooded during heavy rains and high tides	Flooded by blocked or broken sewer	Uncollected garbage	Do not have household toilet	Do not have household sewage system
1	Le Thi Muu	1	20 - 60 (U)	2	2	0	1	2	2	1
2	Tran Van Lai	1	20 - 60 (D)	1	2	0	1	1	1	1
3	Nguyen Thi Thu	1	0 - 20 (U)	1	2	1	0	0	0	0
4	Pham Cong	2	20 - 60 (D)	2	2	1	1	1	1	1
5	Nguyen Thi Hien	2	60 - 100 (U)	1	2	0	0	2	2	2
6	Le Doan Hung	3	20 - 60 (U)	1	2	0	0	1	0	0
7	Nguyen Thi Ngoc lan	3	NA (U)	1	1	1	2	0	2	2
8	Vo Van Truong	4	100 - 200 (D)	2	1	2	2	2	0	1
9	Nguyen Van Le	4	20 - 60 (U)	2	1	NA	2	1	NA	2
10	Truong Thanh Hau	6	0 - 20 (U)	0	2	0	0	0	2	1
11	Nguyen Dinh Cam	6	60 - 100 (U)	1	2	1	1	1	1	2
12	Nguyen Van Phuc	6	20 - 60 (D)	2	2	1	2	0	0	0
13	Truong Huu Thanh	6	0 - 20 (D)	1	2	NA	NA	0	NA	NA
14	Pham Ngoc Tam	6	20 - 60 (D)	1	2	1	1	1	1	2
15	Bui Thi Ha	7	20 - 60 (U)	2	2	1	1	2	1	1
16	Nguyen Van Vuot	8	0 - 20 (U)	1	2	0	2	1	1	2
17	Pham Xuan Dung	8	20 - 60 (U)	2	2	2	2	2	1	2
18	Nguyen Van Hue	8	0 - 20 (D)	1	1	2	2	2	1	2
19	Nguyen Thi Le Mai	9	60 - 100 (U)	2	2	2	2	2	0	2
20	Nguyen Dinh Chi	9	20 - 60 (D)	2	2	0	1	2	1	2

U = upstream of outlet

D = downstream of outlet

0 = not affected

1 = lightly affected

2 = moderately affected

NA = no answer

**Measures Recommended by Respondents to  
Resolve Environmental Problems in Their Area**

Survey No.	Name of household head	Outlet No.	Distance from HH to outlet (m)	Control flooding	Upgrade or renew sewage	Treat wastewater	Rehabilitate toilets	Improve solid waste collection	Construct sewage systems
1	Le Thi Muu	1	20 - 60 (U)	0	1	2	1	1	1
2	Tran Van Lai	1	20 - 60 (D)	0	1	1	1	1	2
3	Nguyen Thi Thu	1	0 - 20 (U)	0	1	2	0	2	1
4	Pham Cong	2	20 - 60 (D)	0	1	1	1	2	0
5	Nguyen Thi Hien	2	60 - 100 (U)	0	0	2	1	NA	2
6	Le Doan Hung	3	20 - 60 (U)	1	2	1	0	1	2
7	Nguyen Thi Ngoc lan	3	NA (U)	2	1	2	2	2	2
8	Vo Van Truong	4	100 - 200 (D)	2	2	2	0	2	2
9	Nguyen Van Le	4	20 - 60 (U)	2	2	1	1	1	2
10	Truong Thanh Hau	6	0 - 20 (U)	0	0	1	1	1	2
11	Nguyen Dinh Cam	6	60 - 100 (U)	2	2	2	0	1	1
12	Nguyen Van Phuc	6	20 - 60 (D)	1	2	2	0	1	NA
13	Truong Huu Thanh	6	0 - 20 (D)	0	1	2	0	0	1
14	Pham Ngoc Tam	6	20 - 60 (D)	2	2	2	1	1	1
15	Bui Thi Ha	7	20 - 60 (U)	1	2	2	0	1	1
16	Nguyen Van Vuot	8	0 - 20 (U)	1	1	2	1	1	1
17	Pham Xuan Dung	8	20 - 60 (U)	2	1	2	1	2	2
18	Nguyen Van Hue	8	0 - 20 (D)	1	1	2	1	2	2
19	Nguyen Thi Le Mai	9	60 - 100 (U)	2	2	2	0	2	2
20	Nguyen Dinh Chi	9	20 - 60 (D)	0	1	1	1	2	1

U = upstream of outlet  
D = downstream of outlet

0 = not important  
1 = important

2 = very important

## Expected Environmental Impacts during Construction

Survey No.	Name of household head	Outlet No.	Distance from HH to outlet (m)	Increased traffic	Increased noise	Increased dust	Increased accidents	Interrupt water supply	Interrupt drainage	Stockpiles of materials and dredge sediments	Increased garbage from construction	Increased odors
1	Le Thi Muu	1	20 - 60 (U)	1	2	2	1	1	1	1	2	2
2	Tran Van Lai	1	20 - 60 (D)	0	1	1	0	1	1	2	0	0
3	Nguyen Thi Thu	1	0 - 20 (U)	2	2	2	0	0	0	1	2	2
4	Pham Cong	2	20 - 60 (D)	1	1	1	1	1	1	1	1	1
5	Nguyen Thi Hien	2	60 - 100 (U)	1	1	1	0	1	1	1	1	1
6	Le Doan Hung	3	20 - 60 (U)	2	2	2	1	0	0	2	2	2
7	Nguyen Thi Ngoc lan	3	NA (U)	2	2	2	1	1	1	2	2	2
8	Vo Van Truong	4	100 - 200 (D)	2	2	2	2	1	1	1	2	2
9	Nguyen Van Le	4	20 - 60 (U)	1	2	2	1	1	1	2	2	2
10	Truong Thanh Hau	6	0 - 20 (U)	0	1	2	0	0	1	0	2	2
11	Nguyen Dinh Cam	6	60 - 100 (U)	2	2	1	2	1	1	1	2	2
12	Nguyen Van Phuc	6	20 - 60 (D)	1	1	2	1	0	0	1	1	2
13	Truong Huu Thanh	6	0 - 20 (D)	1	2	2	0	1	1	0	1	2
14	Pham Ngoc Tam	6	20 - 60 (D)	2	2	1	2	1	1	1	2	2
15	Bui Thi Ha	7	20 - 60 (U)	1	2	2	1	1	1	1	1	2
16	Nguyen Van Vuot	8	0 - 20 (U)	0	1	1	1	0	0	1	1	1
17	Pham Xuan Dung	8	20 - 60 (U)	2	1	1	1	1	1	1	2	2
18	Nguyen Van Hue	8	0 - 20 (D)	2	2	1	2	1	1	1	1	2
19	Nguyen Thi Le Mai	9	60 - 100 (U)	2	2	2	1	0	0	1	1	2
20	Nguyen Dinh Chi	9	20 - 60 (D)	1	2	2	1	1	1	2	1	2

U = upstream of outlet

D = downstream of outlet

0 = no impact  
1 = light impact2 = moderate impact  
NA = no answer



## Expected Impacts of Increased Outlet Discharges with Phase 1 Household Connections

Survey No.	Name of household head	Outlet No.	Distance from HH to outlet (m)	Increased wastewater discharge to receiving water	Increase pollutants in river	Increased pollutants in groundwater	Increased odors	Increased public health risks	Increase in mosquitos and flies
1	Le Thi Muu	1	20 - 60 (U)	2	2	NA	2	2	2
2	Tran Van Lai	1	20 - 60 (D)	2	2	NA	2	2	2
3	Nguyen Thi Thu	1	0 - 20 (U)	2	2	NA	2	2	2
4	Pham Cong	2	20 - 60 (D)	2	2	NA	2	2	2
5	Nguyen Thi Hien	2	60 - 100 (U)	2	2	NA	2	2	2
6	Le Doan Hung	3	20 - 60 (U)	2	2	1	2	2	2
7	Nguyen Thi Ngoc lan	3	NA (U)	2	2	1	2	2	2
8	Vo Van Truong	4	100 - 200 (D)	2	1	2	2	2	2
9	Nguyen Van Le	4	20 - 60 (U)	1	1	1	2	2	2
10	Truong Thanh Hau	6	0 - 20 (U)	2	2	1	2	2	2
11	Nguyen Dinh Cam	6	60 - 100 (U)	2	2	2	2	2	2
12	Nguyen Van Phuc	6	20 - 60 (D)	2	2	2	2	2	2
13	Truong Huu Thanh	6	0 - 20 (D)	2	2	1	2	1	2
14	Pham Ngoc Tam	6	20 - 60 (D)	2	2	2	2	2	2
15	Bui Thi Ha	7	20 - 60 (U)	2	1	2	2	2	2
16	Nguyen Van Vuot	8	0 - 20 (U)	2	2	1	2	2	2
17	Pham Xuan Dung	8	20 - 60 (U)	2	2	1	2	2	2
18	Nguyen Van Hue	8	0 - 20 (D)	2	2	2	2	2	2
19	Nguyen Thi Le Mai	9	60 - 100 (U)	2	2	1	2	2	2
20	Nguyen Dinh Chi	9	20 - 60 (D)	2	2	1	2	2	2

U = upsteram  
D = downstream

1 = light impact      2 = moderate impact      NA = no answer

## Recommended Mitigation Measures for Increased Outlet Discharges

Survey No.	Name of household head	Outlet No.	Distance from HH to outlet (m)	Use chlorine treatment	Install coarse screen on outlet	Monitor water quality	Regularly check and dredge outlet area	Conduct public awareness campaign
1	Le Thi Muu	1	20 - 60 (U)	2	2	2	2	2
2	Tran Van Lai	1	20 - 60 (D)	2	2	2	2	2
3	Nguyen Thi Thu	1	0 - 20 (U)	2	2	2	2	2
4	Pham Cong	2	20 - 60 (D)	2	2	2	2	2
5	Nguyen Thi Hien	2	60 - 100 (U)	2	2	1	2	2
6	Le Doan Hung	3	20 - 60 (U)	2	2	2	2	2
7	Nguyen Thi Ngoc lan	3	NA (U)	2	2	2	2	2
8	Vo Van Truong	4	100 - 200 (D)	2	2	2	2	2
9	Nguyen Van Le	4	20 - 60 (U)	2	2	2	2	2
10	Truong Thanh Hau	6	0 - 20 (U)	2	2	2	2	2
11	Nguyen Dinh Cam	6	60 - 100 (U)	2	2	2	2	2
12	Nguyen Van Phuc	6	20 - 60 (D)	2	2	2	2	2
13	Truong Huu Thanh	6	0 - 20 (D)	2	2	1	2	2
14	Pham Ngoc Tam	6	20 - 60 (D)	2	2	2	2	2
15	Bui Thi Ha	7	20 - 60 (U)	2	2	2	2	1
16	Nguyen Van Vuot	8	0 - 20 (U)	2	2	1	2	2
17	Pham Xuan Dung	8	20 - 60 (U)	2	2	2	2	2
18	Nguyen Van Hue	8	0 - 20 (D)	2	2	2	2	2
19	Nguyen Thi Le Mai	9	60 - 100 (U)	2	2	2	2	2
20	Nguyen Dinh Chi	9	20 - 60 (D)	2	2	2	2	2

U = upstera

1 = light mitigation effect

D = downstream

2 = moderate mitigation effect

## ANNEX 3.5 Disclosure Letter for Dong Hoi Draft EA

QUANG BINH PPC  
CCESP, DONG HOI SUB-PROJECT

SOCIALIST REPUBLIC OF VIETNAM  
Independent Freedom Happiness

N<sup>o</sup>. 06 /TT-CBDA

Dong Hoi, January 16, 2005

Respectfully to - World Bank, Viet Nam  
- Mr. William Kingdom

Subject: "kindly request World Bank to disclose Draft Environment Impact Assessment (EIA)  
for phase 1 at VDIC in Hanoi and Inforshop in Washington D.C.

Dear sirs,

Currently, this Draft Environment Impact Assessment (EIA) for phase 1 was adjusted in accordance with its' environmental safeguard policy and International consultant (TBC) submitted to World Bank, as well as requirement of that policy. We kindly request the World Bank to disclose this draft EIA for phase 1 of Coastal City Environment and Sanitation Project - Dong Hoi Sub-Project, Quang Binh province.

The EIA was adjusted that based on reviews and comments/adjustment of the World Bank as well Environmental specialist, the Quang Binh Department of Natural Resources and Environmental and Project preparation Unit of Dong Hoi city, the original version was previous submitted on Nov 16, 2005.

The draft EIA for phase 1 we disclose from January 11 to Feb 15, 2006 at the following places:

1. The office of the Quang Binh Province People's Committee.
2. The office of the Project preparation Unit of Dong Hoi city, Quang Binh province.
3. The office of the Department of Natural Resources and Environmental of Quang Binh.
4. The office of the Wards in which people have been affected by project.

After we disclosed the EIA for phase 1 in our city as well we would like to require World Bank to disclose these Documents at VDIC in Hanoi and Inforshop in Washington D.C.

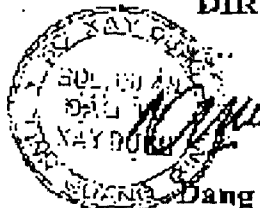
We submitted to World Bank four (4) hard copies in English and one (1) copy in Vietnamese and would like the World Bank in Vietnam to disclose them at VDIC in Hanoi and Inforshop in Washington D.C.

Sincerely yours

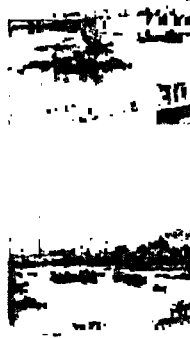
Cc:

- As above
- Mrs. Thanh PHUONG (Environmental Specialist);
- Mrs. Phuong HOA;
- Mrs. Thuong GIANG (Program Assistant);
- File of PPL office

DIRECTOR



Dang Duc Duc



# ANNEX 4

## Recommended Standard Operating Procedures (SOPs) for Environmental Management during Construction

## Annex 4

# Recommended Standard Operating Procedures (SOP) for Environmental Management of CCESP Subprojects

### I. CONDITIONS OF CONTRACT

1.1 Safety: The Contractor shall be responsible for the safety of all activities on the Site.

1.2 Discoveries

Anything of historical, cultural, archeological or other interest or value unexpectedly discovered within the Site or during excavations shall be the property of the Government. The Contractor shall immediately notify the Project Manager of such discoveries and carry out the Project Manager's instructions for properly dealing with them.

### II. CONTRACT DATA

The Contractor shall, throughout the execution and completion of the Works and the remedying of any defects therein:

- a) Have full regard for the safety of all persons entitled to be upon the Site and keep the Site (so far as the same is under his control) and the Works (so far as the same are not completed or occupied by the Employer) in an orderly state appropriate to the avoidance of danger to such persons, and
- b) Provide and maintain at his own cost all lights, guards, fencing, warning signs and watching, when and where necessary or required by the Engineer or by any duly constituted authority, for the protection of the Works or for the safety and convenience of the public and others, and
- c) Take all reasonable precautions to avoid harm to the living and working environment. Such precautions shall include but not be limited to the following:
  - (i) provision of sanitation facilities to prevent the biological or factory pollution of the Site or any water course, stream, well, tank, reservoir or water supply.
  - (ii) avoidance of wanton destruction of flora and fauna.
  - (iii) avoidance of excessive noxious gaseous or smoke emission from plant and other operations in connection with the Works;
  - (iv) avoidance of damage or interruption to water courses, irrigation channels and drainage paths;
  - (v) avoidance of excessive harmful or objectionable noise emission.

If the Engineer considers that inadequate precautions have been made to comply with these requirements, the Contractors shall take such further precautions or measures as the Engineer shall reasonably direct.

### III. SPECIFICATIONS

3.1 Mobilization and Demobilization

- (a) Mobilization and installation of Construction Plant from their existing locations to the sites where they are to be used under this contract.
- (b) Provision and maintenance of the Contractor's base camp, including as necessary, site offices, living quarter, workshop and stores, etc.
- (c) Strengthening of existing bridges for transport of construction equipment.

### 3.2 Field Offices and Facilities

#### A. General

##### 1. Description of Work

Contractor shall, under this Selection, construct, furnish, install, maintain, clean, guard and at the completion of the Contract, remove or dispose, all temporary field offices, storage sheds, living quarters, and workshops, that are required for the management and supervision of the project.

##### 2. General Requirements

- (a) The contractor must at all times comply with the requirements of National and Provincial regulations.

### 3.3 Transportation and Handling

#### A. General

1. Standards: Work processes shall be conducted in conformity with National, Provincial and District regulations governing the work as well as requirements for the preservation of natural resources and the environment.

##### 2. Transportation Weight Limitations

- a) If required, the Engineer may impose weight restrictions for the protection of any existing road or structure within the vicinity of the project.
- b) The Contractor shall be responsible for any damage to roads or structures resulting from his construction operations.
- c) If, in the opinion of the Engineer, the Contractor's hauling operations are causing damage to a public road or structure, or in the event of any flooding that halts the Contractor's hauling operations, the Engineer may direct the Contractor to use an alternative route, and the Contractor shall have no right to claim for additional compensation as a result of the Engineer's instruction.

##### 3. Disposal of Material Outside the Site

- a) The Contractor shall make his own arrangements for the disposal of materials outside the Right - of - Way (ROW).
- b) When any material is to be disposed of outside the Site, the Contractor shall obtain a written permit from the property owner on whose property the disposal is to be made, which permit shall designate the disposal location and shall be submitted to the Engineer together with a request for approval to proceed.
- c) When material is disposed of as provided above and the disposal location is visible from a highway, the Contractor shall dispose of the material in a neat and uniform manner to the satisfaction of the Engineer.

### 3.4 Maintenance of Traffic Flow

#### A. General

1. **Description:** To ensure that during the performance of the Works all existing roads are kept open for traffic and are maintained in a safe and usable condition, and that residents along and adjacent to the Works are provided with safe, convenient access to their properties. In particular circumstances the Contractor may reroute traffic over temporary road works. This requires the Engineer's approval and conformance.
2. **Land Required:** Before starting construction, the Contractor shall make all necessary arrangements, including payment if required to any landowners concerned, for the use of the land and, shall obtain the approval of the responsible authority and the Engineer. Upon completion of the Works, the Contractor shall clean and restore the land to its original condition to the satisfaction of the Engineer and the landowner concerned.

#### B. Temporary Traffic Control

1. **Signs and Barriers:** In order to protect the Works, to ensure the safety of the public and to facilitate the free traffic flow through or around the Works and Contractor shall erect and maintain traffic signs, barriers, and other like facilities at any place where construction operations interfere with the use of the road by traffic. All signs and barricades shall include reflective strips or an alternative means enabling them to be observed after dark.
2. **Flagmen:** The Contractor shall also provide and station competent flagmen to all places where the construction operations interfere with the flow of traffic. Their sole duties shall consist of directing and controlling movement of traffic through or around the Works.

#### C. Maintenance for Traffic Safety

1. **Temporary Road Works and Traffic Control:** All temporary works and traffic control installations provided by the Contractor shall at all times during the performance of the Works be maintained in a safe and serviceable condition to the requirements and satisfaction of the Engineer, to ensure the safety of traffic and of the public.
2. **Clearance of Obstructions:** At all times during the performance of the Works, the Contractor shall ensure that the pavement, shoulders and adjacent areas within the right-of-way shall be maintained free of construction material, debris or other such loose objects that may obstruct or endanger the free and safe passage of traffic. The Works shall also be maintained free of any unauthorized parking or street trading activity except in areas designated for such purposes.

### 3.5 Field Engineering

During the first thirty days of the mobilization period, the Contractor shall deploy his engineering personnel to survey and report on the physical and structural condition of the existing road pavement and drainage ditches.

### 3.6 Materials and Storage

#### A. General

Material incorporated into the works shall:

- (a) Conform to applicable specifications and standards

- (b) Comply with size, make, type and quality specified on the drawings or in other section of these specifications, or as specifically approved in writing by the engineer.
- (c) All products are to be new.

### 3.7 Construction Schedule

Provide on a separate schedule, the location of all materials sources, together with planned submittal dates for material samples and planned material production and delivery schedule.

### 3.8 Cleaning

#### A. General

1. Description: During the period of construction activity the Contractor shall maintain the Works free from accumulation of waste, debris, and rubbish, caused by the construction operations. At the completion of the Works all waste and surplus materials, rubbish, tools, equipment and machinery shall be removed, all sight-exposed surfaces shall be cleaned and the project left in a condition ready for occupancy to the satisfaction of the Engineer.

#### B. During Construction

- 2) Execute regular cleaning to ensure that site works, structures, temporary offices and accommodation quarters, are maintained free from accumulations of waste materials, rubbish, and other debris resulting from the site work operations and maintain the site in a neat and orderly condition at all times.
- 3) Ensure that the drainage system is maintained free of debris and loose material and is in an operational condition at all times.
- 4) When required, spray dry materials and rubbish with water to prevent blowing dust or sand.
- 5) Ensure that traffic signs the like are regularly cleaned free of dirt and other materials.
- 6) Provide on-site drum containers for the collection of waste materials, debris and rubbish awaiting removal from site.
- 7) Dispose of waste material, debris and rubbish at designated dumping areas and in accordance with National and Provincial ordinances and anti-pollution laws.
- 8) Do not bury rubbish and waste materials on the project site without the approval of the Engineer.
- 9) Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinners in storm or sanitary drains.
- 10) Do not dispose of wastes into streams or waterways.

### 3.9 Environmental Aspects

#### A. General

- (1) Description: The Contractor shall understand the environmental impact that possibly occurred due to construction activities, and the method of handling shall be as directed by the Engineer.



Prior to carry out physical activities in the site, the Contractor shall provide a program of environmental management execution which shall obtain the Engineer's approval.

**B. Environmental Management Implementation**

All vehicles and machinery are properly silenced with mufflers.

- 1) All vehicles and machinery emit an amount of exhaust compatible with the existing air quality standards.
- 2) The operation and maintenance of all vehicles and machinery is adequately made according to the manufactures' specifications and does not contaminate natural water and ground.
- 3) Except where determined otherwise by the Engineer, all work activities should be implemented in daytime hours.

For the recruitment of labor force priority, for the same availability of the tasks and skills, is given to local workers. Amongst the local labor force, priority is given to those affected by the works.

- 9) Land clearing activity is carried out in the areas strictly necessary to the works.
- 10) Replanting of trees and bushes shall follow these directives:
  - (a) Replacement of the same species as removed whenever possible is required,
  - (b) In the case of slow growing species, three years old or more plants should be replanted, except in the case of species which would not be able to recreate the original lines or sufficient soil protection condition for a very long time. Otherwise, medium to fast-growing species should be utilized,
  - (c) Species whose root system do not affect road stability and which do not require high maintenance cost, are preferable,
  - (d) Regular maintenance of replanted vegetal species is required.
  - (e) Plants which have died after being planted must be replaced.
- 11) The surface areas producing a significant amount of dust in the atmosphere because of the works must be are regularly watered.
- 12) Damage or disturbance to public utilities such as telephone network, electricity, gas, water lines, irrigation facilities, oil pipes, sewer lines, drainage pipes, etc., are prevented by obtaining and using information about the presence and location of existing utilities, particularly for those lying under the ground.
- 13) The Contractor shall be responsible for the care and protection of any still serviceable underground piping, cables, conduit or other subsurface lines that may be encountered and for repairing any damage caused to them by these operations.
- 14) If wells lying close to the works site are affected by cut and fill activity, an equivalent alternative supply, eventually by implementing new wells, dug or drilled, as near as possible to the previous source, is provided.
- 15) Fuel spill and releases of polluting wastes deriving from the works are prevented.