HA TINH PROVINCIAL PEOPLE'S COMMITTEE

DYNAMIC CITIES INTEGRATED DEVELOPMENT PROJECT

KY ANH SUBPROJECT – HA TINH PROVINCE

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

(ESIA)

Final Report

Ha Tinh, Dec - 2018

CONTENTS

ABBREVIATIONS AND ACRONYMS

Ahs	Affected Households
CC	Climate change
AC	Asphalt concrete
CeC	Cement concrete
CMC	Construction monitoring consultant
DED	Detailed engineering design
DOC	Department of Construction
DOF	Department of Finance
DONRE	Department of Natural Resources and Environment
DOT	Department of Transport
DPI	Department of Planning and Investment
EIA	Environmental impact assessment
ESIA	Environment and Social Impact Assessment
ECOP	Environmental Code of Practice
EMC	External Monitoring Consultant
ESMP	Environmental and Soical Management Plan
EMS	Environmental monitoring system
FS	Feasibility study
HH	Household
MONRE	Vietnam Ministry of Natural Resources and Environment
ODA	Official Development Assistance
PMU	Project Management Unit
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
RP	Resettlement Plan
P/CPC	Provincial/City People's Committee
WB	World Bank
WWTP	Wastewater Treatment Plant

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

Project Background and Proposals. The Dynamic City Integrated Development Project (DCIDP) has been proposed to "increase access to improve urban technical infrastructure and capacity building for urban planning and management in the cities of the Project" which is in line with the Vietnam Masterplan for Urban Development (approved by the Prime Minister in 2009). The DCIDP covers five cities and towns including Tinh Gia and Ky Anh Towns, Hai Duong, Thai Nguyen and Yen Bai cities.

The Ky Anh subproject is comprised of two components, including:

Component 1: **Construction of Technical and Urban Transport Infrastructure.** Under this Component, construction and rehabilitation of the following infrastructure has been proposed:

(i) **Construction of main road to connect urban centers** in new urban road crossing Ky Trinh, Ky Hung and Ky Chau communes. L = 3.75 km, the width of Right of Ways (ROW) ranges from 16 to 20m. Three new bridges will be built on this road, B = 16 to 20 m, L = 58 to 83 m

(ii) **Construction of wastewater collection and treatment system**: Build a newwastewater collection and treatment system capacity Q = 2,000 m^3/day using biological pond technology, 11 pumping stations, and approximately 40 km of sewers.

(iii) **Embankment lining and construction of embankment-side road along Tri river:** - Lining the left and right embankments along 1.5 km of the Tri river. Build or upgrade the road on the top of the embankment, B = 13m.

(iv) **Upgrading and rehabilitating Thuy Son lake:** Dredging Thuy Son lake with area 1.9ha and constructing 2 km solid embankment around the lake.

Component 2: **Technical Assistance and Implementation Support**

An Environmental and Social Assessment and an Environmental and Social Management Plan (ESIA/ESMP, this document) has been prepared to meet the requirements of the World Bank's Safeguard Policies. Public consultations were carried out during the preparation of the draft ESIA/ESMP. The Project will also comply with applicable Vietnamese environmental legislations. The draft ESIA/ESMP has been disclosed locally in Project area at the end of November 2017 and on the Bank website on 28 November 2017. The main contents of the ESIA/ESMP includes:

Chapter 1: Project Description
Chapter 2: Socio-economic and Environmental Baseline Conditions
Chapter 3: Environmental and social Impacts Assessment
Chapter 4: Analysis of Alternatives
Chapter 5: Environmental and Social Management Plan
Chapter 6: Public Consultations and Information Disclosure
Conclusions and Recommendations

The Ky Anh Project is scheduled to be implemented from 2018 to 2022, with a total investment cost of approximately 54.72 million USD.

Baseline Conditions.

The Ky Anh subproject area is located in the northern central region of Vietnam. Economic development as well as development of internal traffic system of Ky Anh mainly depend on National Highway 1A. Existing drainage system is incomplete, and wastewater has not been collected but being discharged into the environment without being treated. The inner area is usually get localized inundation due to incompleteness of Tri river embankment. The Thuy Son lake is located in the central area of the town and has been blocked up, sedimented and there is no water in the lake in dry weather. Analysis data shows that the tested heavy metal contents in the sediment samples taken from dredging areas are within allowable limits specified in relevant Vietnamese Environmental Standard.

Potential Social and Environmental Impacts and Risks.

The Project has been classified as Environmental Category B by the World Bank. The social and environmental potential impacts and risks have been identified and assessed in Chapter 3 of the ESIA. In general, the proposed subproject would bring significant positive impacts for the environment and the people in Ky Anh Town. The provisions of the new infrastructure would contribute to socio-economic development in the subproject area, improving urban environmental sanitation conditions and landscape, benefiting human health. The construction of the trunk urban road would help to improve connectivity between Ky Trinh urban center with the neighboring industrial zones and food supply areas of Ky Anh town. Local people will be benefited from a healthier and more sustainable living environment. Public health risks related to water-borne diseases in the subproject areas would be reduced after untreated wastewater is collected and treated before being discharged into the environment. Lining the embankment and construction of operational roads along the Tri river would help to reduce flood and inundation at the riverside area. Urban environment and landscape would be improved with the rehabilitation of the Thuy Son Lake and the construction of the wastewater collection and treatment system.
Beside the significant positive impacts, the ESIA assessed that there would be also some negative impacts and risks during the pre-construction, construction and operations of the infrastructure provided under the subproject.

Pre-construction Impacts and Risks. In terms of land acquisition and resettlement, the Project would acquire 170,258m^2 of land including approximately 128,595 m^2 of agricultural land and 19,415 m^2 of residential land. Total 344 households (HH) will be affected by the Project, in which 14 HH will have to be relocated, 16 HH are vulnerable and 91HH are severely affected by agricultural land acquisition. Noticeably, the project will also require the relocation of the Nguyen Ca family worshipping house (40 m^2, built in 2008). The affected family was consulted, and they indicated they would accept to relocate relocate the worshipping house if that compensation is reasonable. As the sub-project area was subjected to civil wars in the past, there would be the risks that some UXO (unexploded materials) have been left underground in the subproject area.

Construction Impacts and Risks. Most of common construction impacts would be localized, at low to moderate levels, including: increased dust, noise and vibration levels, solid waste and wastewater generation, surfacewater quality reduction, localized flooding issues, sedimentation, landslide and erosion risks, health and safety of the workers and communities,

negative impacts on urban landscape, traffic disturbance and increased traffic safety risks, damages to existing infrastructure (power/water supply, irrigation, roads etc.), disruptions of related services, social disturbance, concerns about health and safety of local communities and the workers. About 70,000 m3 of solid waste would be generatd from excavation for pipe trenching. On the other hand, the construction of the trunk road with ground elevation could be up to 3.8 m above existing ground level may also cause reduced accessibility to existing agricultural land located along the two sides of the road. The risks related to labor influx have also been assessed and considered as low under the subproject. The ESIA also have identified site-specific impacts and risks of each work item where sensitive receptors (such as kindergarten, temple, residential clusters, ancestral worshipping etc.) are located, or water quality reduction related to salinity of dredged materials.

Operation Impacts and Risks. The main social and environmental risks during the operation of the new roads and bridges are traffic safety risks on the road/bridge, particularly at the junctions between the new roads and the existing roads. In addition, the new road (of which the elevation at road surface would be up from 0 m to 3.82 m higher than existing ground level) may also cause localized flooding risks and reduced accessibility between the two sides of the new roads, which is mostly agricultural land. Rehabilitation of Thuy Son lake and Tri river embankment will pose the risks on traffic safety at the intersection and the staircases on the embankments, particularly Thuy Son lake because the embankment will be more sloping that existing status. Odors, health and safety of the workers and the public would be the issues that should be considered during the operation phase of the wastewater treatment plant, including wastewater pumping stations.

Mitigation Measures.

To address the identified and assessed potential impacts and risks identified in Chapter 3, mitigation measures have been proposed and presented under the Environmental and Social Management Plan (ESMP) presented in Chapter 5.

At feasibility study and detail engineering design stages, environmental-firendly and greening solutions were proposed for addressing some impacts during operation phase. For examples: combinations between engineering with greening solutions for slop protection at the new road shoulders and embankment, design of the road intersections includes measures to maintain accessibility for local communities and to reduce traffic safety risks, staircases are built at intervals of the embankments to maintain safe and convenience access to water surface for local communities. Drainage and convenience access has been proposed address the embankment effect of the trunk road which is higher than the existing ground level. The WWTP has been design with adequate buffer zone and space for tree planting to reduce odor and other operational concerns etc.

For pre-construction impacts and risks, a budget estimated at approximately USD 77,677 has been proposed for UXO clearance. A Resettlement Action Plan (RAP) has been prepared to address land acquisition impacts of the subproject. An estimated budget at approximately 82.6 billion VND (about 3.7 million USD) for land acquisition and compensation, and for livelihood compensation program (detail see RAP).

Table 1 – Compensation and Supports to Affected Households

No.	Description	Volume	Amount
A	**Land**		**44,897,686,567**
A.1	Residential land	19,416	39,341,603,000
A.2	Agricultural land	128,594.58	5,556,083,567
B	**House/structure**		**12,988,870,000**
C	**Crop, vegetation**		**1,335,713,580**
D	**Sub-total 1**		**59,222,270,147**
E	**Support**		**16,526,838,763**
E.1	Support for transportation, resettlement	14	84,000,000
E.2	Support for house renting for displaced HH	14	100,800,000
E.3	Support for life stabilization	344	3,219,840,000
E.4	Job change	128,595	12,160,198,763
E.5	Support to Vulnerable household	16	32,000,000
E.6	Support to Business establishment	11	55,000,000
E.7	Self-relocation	14	700,000,000
E.8	Incentive bonus	35	175,000,000
F	**Sub-total 2**		**75,749,108,910**
G	**Management cost**		**6,817,419,802**
H	**Total**		**82,566,528,712**
	Rounded		**82,570,000,000**
	In USD		**3,669,778**

A set of mitigation measures for addressing common construction impacts have been proposed in the form of Environmental Codes of Practices (ECOP, Table 70 in the main report) for incorporation into construction bidding documents. For example, the contractors are required to inform local communities at least two weeks before construction commencement. They are required to ensure that the trucks must be covered during transportation of construction materials, or drainage and sedimentation traps must be installed to prevent sedimentation in surfacewater sources, ground area to be disturbed must be kept minimal, site protection measures must be applied to manage safety risks for both the workers and local communities, adequate protective cloths and camp facilities must be provided for the workers to use to protect occupational health etc. Chance find procedures have also been included in the ECOP. The Workers Code of Conducts were also developed as part of ECOP to address the concerns that may be arisen from labor influx (although quite small). Part of the solid waste generated under the subproject will be reused for refilling the pipe trenchs, the remaining will be used for filling the existing holes at Cup Coi quarry which were formed from stone exploitation. In addition, the ESMP also proposed that training on HIV/AIDs awareness for the workers and construction supervision teams will also be provided during the implementation of this subproject. The estimated cost for this training is 160,000,000 VND.

In addition, construction site-specific mitigation measures such as installation of sheet piles at deep excavation to prevent land slide risks were also proposed, or provision of safe access for local residents to travel between the two sides of the trunk road during construction phase were also proposed in the ESMP. Such measures were presented in the form ready for

inclusion into bidding documents. The site-specific mitigation measures at sensitive-receptors are presented in the Table below:

Table 2 – Site-specific Impacts and Mitigation Measures of Sensitive Receptor

Name, Picture / Distance to construction site	Site-specific Impacts and Risks	Site-specific Mitigation Measures
Thuy Son Lake		
Song Tri primary school is located 10 m from the lake 	- Noise from the truck, car horn distracts teaching and learning activities - Increased traffic safety risks during school opening and closing hours - Accident risk for students if entering the construction area - Odor and dust from dredged material. - Negative impact on landscape.	- Set up 3m-high solid fences around the construction site of the Thuy Son lake. Place sign board on the fence in front of school. - Inform school managers at least one week in advance before construction commencement. - Avoid activities generating high noise during school hours, particularly in December and May (exam season). - Install speed limit at 5km/h sign at the two ends of the section - Arrange staff to direct traffic at school opening and school over time at sections in front of the school - Transport the excavated material away from the site as soon as possible
Km 0+830: No name temple located at 5 m from construction site 	- Negative impact on the landscape in the area in front of the temple. - Obstruct access to the temple	- Do not load materials and wastes or park vehicles within 20m from the temple, tidy up the temple daily - Collect and clean up materials and waste dropped around this area regularly
- Km 3+650: Ky Anh General Hospital, 0-5m from the construction site. 	- Safety risks for the patients and doctors when present near the gate of the hospital particularly at night time, rush hours, during the handling of bulky items such as pre-casted pipes - Dust and noise disturb, affect the patients in the hospital	- Inform community at least two weeks before construction commencement. - Install “slow down” and “road work” as the two end of construction area. - Provide adequate lighting at night time. - Do not load materials and wastes on the road, tidy up the sites daily. - Avoid activities generating high noise between 10 pm and 6 am - Water the road, particularly excavation area, in hot, dry, windy weather
- Km 4+890: the memorial is 7 m from the road 	- Impacts on landscape in the area near the memorial	- Schedule construction of the section passing the memorial to avoid the Memorial Day 27 July, 1st and 15th of lunar month. - Do not load materials and wastes within 50 m from the memorial gates.

Name, Picture / Distance to construction site	**Site-specific Impacts and Risks**	**Site-specific Mitigation Measures**
- Km 1+560: the memorial is 7 m from the construction site 	- Traffic disturbance or interruptions - Impacts on landscape in the area near the memorial	- Install warning signs and signboards - Arrange staff to direct traffic in rush hours - Provide temporary access to houses and shops when access is disrupted - Schedule construction of the section passing the memorial to avoid the Memorial Day. - Do not load materials and wastes within 50 m from the memorial gates.
Km 1+670: the pipeline passes in front of Ky Hung commune preschool. 	- Increased traffic safety risks - Affect the movement of students and affect children's health and beauty of school building - Noise distract teaching activities and disturb sleep at lunch time	- Inform school managers at least one week in advance. - Install speed limit at 5km/h sign at the two ends of the section - Arrange staff to direct traffic at school opening and school over time at sections in front of the school. - Install fence and warning signs open holes, channels - Do not load materials and wastes within 50 m from school gates - Do not load or unload materials during rush hours
Km 1+770: the ancient well is 3 m from the road 	- Impacts of landscape values - Risks of being damaged by vibration compaction	- Inform community at least two weeks before construction commencement. - Install "slow down" and "road work" as the two end of construction area - Apply static compaction method at this area - Do not load materials and wastes within the ground surrounding the well
Km 0+680: piplines Ky Hung commune primary school 	- Increased traffic safety risks - Affect the movement of students dust affect children's health and beauty of school building - Noise distract teaching activities and disturb sleep at lunch time	- Inform school managers at least one week in advance. - Install speed limit at 5km/h sign at the two ends of the section - Arrange staff to direct traffic at school opening and school over time at sections in front of the school. - Install fence and warning signs open holes, channels - Do not load materials and wastes within 50 m from school gates - Do not load or unload materials during rush hours

The ESMP included an Dredging and Dredged Material Management Plan (DMMP) in order to assess in detail the potential social and environmental impacts related to limited dredging activities at the Tri river and the Thuy Son lake. The main specific issue is the management of the dredged material during temporay and final disposal. The DMMP proposed that the dredged materials will be transported to the common disposal site of the project which will

be at Cup Coi Mountain for leveling purpose. During temporary loading at lake/river side, leachate from sediment will be returned to the river/lake.

Environmental and Social Management Plan (ESMP).

The ESMP proposed an institutional arrangement and identified responsibilities for the implementation of the stakeholders, as below.

Table 3 – Responsibilities of Stakeholders in Implementing the Environmental and Social Management Plan

Stakeholders	Responsibility
Provincial People's Committee (PPC)	- Overall responsible for socioenvironmental safeguard implementation and compliance monitoring - Ensure that adequate resources are allocated for safeguard implementation and management
Project Management Unit (PMU) - Project Owner	- Be responsible for monitoring and supervision to ensure that the Project comply with the approved ESIA/ESMP - Assign an Environmental Officer (EO) in charge to monitor the implementation and compliance of ESMP, and at least a Social and resettlement Officer (EO) to oversee resettlement and compensation issues - Ensure that the mitigation measures proposed in the ESIA are adequately incorporated into relevant project documents such as engineering design, cost estimations, bidding and contractual documents - Ensure that adequate environmental and safety training, monitoring and supervision tasks are included in the Terms of References of the Construction Supervisors - Communicate and coordinate with relevant authorities at central and local levels, with independent monitoring consultants to facilitate public consultation, implementation of mitigation measures and voluntary monitoring - Coordinate with the Construction supervisors to carry out due diligence review of additional sites such as borrow pits and quarries as and when required - Monitor to ensure timely and effective implementation of the ESMP: - Monitor environmental compliance; - Carry out unannounced inspections; - Review periodical reports submitted by the construction supervision consultant (CSC) and IEMC and take follow up actions - Submit periodical safeguard reports to WB and MONRE. - assure all resettlement activities will take place in compliance with this RP. Specifically, PMU will: - Cooperate with PPCs, and relevant local competent agencies to conduct compensation and resettlement. - Organize training and building capacity activities for PPMUs. - Cooperate with PMUs to monitor compensation, resettlement; - Report periodically on resettlement progress to PPC and the WB.
PMU Environmental Officer (EO)	- The EO will advise the PMU leaders on solutions for environmental issues to ensure the compliance with WB's safeguard polices and regulations stipulated by Vietnamese Government. - The EO will coordinate with the CSC team and the contractors to carry out due diligence review of borrow pits, quarries identified during construction phase and decide whether they are eligible for use in the Project

Stakeholders	Responsibility
	- Coordinate with the Environmental Officer of the Construction Supervision team to carry out environmental due diligence review of borrow pits, quarries, disposal sites as well as any other sites required under the Project
PMU Social and Resettlement Officer	- The Social and Resettlement Officer in charge will help with solving social and resettlement issues of the Project, supervising the compliance with RP, participate in investigation and solving complaints related to social issues and land acquisition.
Design consultant	- Incorporate mitigation measures in to engineering design, cost estimates, bidding documents and construction contract,
Construction Supervision Consultant/Engineer (CSC/CSE)	- Provide training for contractor's workers on environment, occupational safety, HIV/Aids training - Arrange for environmental quality monitoring and report preparation for submission to relevant government authorities - Monitor and supervise the Contractors to ensure compliance with ESIA/ESMP - Direct the Contractors to carry out corrective measures when excessive pollution or any non-compliant is detected - Carry out due diligence review of additional sites such as borrow pits and quarries as and when required - When detecting any excessive pollution or any non-compliant contractor, the construction supervision consultant shall propose and direct related contractors to implement additional mitigation or corrective measures to address the issues/impacts to satisfactory level. - Propose the PMU to suspend partially or entirely the construction work if a contractor fails to meet the requirements on safety and environmental protection as agreed or stated in the contract. - Prepare and maintain records on complaints and incidents
Independent Monitoring Consultant	- provide training to relevant project stakeholders, particularly PMU staff and Construction supervision engineers on project environmental management system - Carry out random monitoring to verify environmental compliance, make recommendations and prepare reports.
Contractors	- Appoint staff responsible for environmental, health and safety issues - Prepare site specific ESMP - Implement mitigation measures in accordance with contract terms and conditions
Community	- Carry out voluntary environmental monitoring according to Decree 19/2015/ND-CP - Participate in consultation activities
Town People's Committee (TPC)	- Prepare annual land use plan and submit to competent authorities for review and approval of changed land use plan. - Issue Notice of Land Acquisition and direct Town Board for Compensation and Land Acquisition. - Adjusting or grant a new land use right certificate for the land to be acquired, and for relocated households. - Settle complaints related to land acquisition, compensation, support and resettlement in the district within its jurisdiction. - Approve compensation support and resettlement assessment to be carried out by the Town BCLA
Town Board for Compensation and Land Acquisition (TBCLA)	- Coordinate with PMU and TPCs to disseminate information and policies on project's policies on compensation and support; - Organize for compensation payment and support to affected people; - Arrange resettlement for relocated households, land acquisition, and handover of acquired land to the construction units;

Stakeholders	Responsibility
	- Lead and coordinate with PMU and TPCs to implement Livelihood Restoration Program; - Assist TPCs to settle complaints concerning land acquisition, compensation and resettlement. - Support TPC in issuance of LURCs for land plot in the resettlement site. - Support the external monitoring consultant for conducting independent resettlement monitoring.
Ward/Commune People's Committee:	- Cooperate with TBCLA in arranging compensation payment, resettlement and livelihood restoration implementation; - Provide documents related to the origin of land use of AHH; confirming the eligibility of affected persons and affected assets; - Assist TPC, TBCLA to organize meetings and public consultations; - Resolve complaints at the ward/commune level - as prescribed by the existing law; Assist authorities to resolve land disputes and complaints.

In addition, the ESMP also have proposed an environmental monitoring and supervision program as well as reporting requirements, capacity building training plan, compliance framework and penalty system as detail in Chapter 5. The total estimated costs for ESMP implementation are summarized below.

Table 4 – The Total Estimated Costs for ESMP

No.	Items	Unit	Quantity	Unit price (VND)	Total amount (VND)
1	UXO Clearance				1,747,733,776
2	Mitigation measures implementation	As a part of construction contracts values			
3	Environmental compliance monitoring	As a part of construction supervision contract value			
4	Environmental quality monitoring				336,928,000
		(as part of construction supervision contract)			
5	Training on HIV /Aids for the workers, PMU staff	Sites	8	20,000,000	160,000,000
		(as part of construction supervision contract)			
6	Independent monitoring, including:				1,060,000,000
	Environmental supervision	*Trip*	*8*	*60,000,000*	*480,000,000*
	Social supervision	*Trip*	*8*	*60,000,000*	*480,000,000*
	Training on capacity building	*Lump sum*		*100,000,000*	*100,000,000*
7	***Total***				***3,304,661,776***

Conclusions and Recommendations.

The "Dynamic Cities Integrated Development Project – the Ky Anh subproject, Ha Tinh province" is a subproject to support cities and urban areas which have significant role and potentiality to become an economic development center in the region to improve urban infrastructure, landscape, connectivity, environmental sanitation and contribute to the town's development.

The ESIA report was prepared in compliance with WB safeguard policies and applicable Vietnamese regulations. The report will be one of the key documents to be submitted to the World Bank and releant Vientamese Environmental authorities for appraisal and approval before Project negotiation.

The environmental impacts were theoretically and empirically assessed with support from the baseline and statistical data as well as experiences from similar WB projects. The impacts are relatively quantified as best as they can be for all three stages of project's pre-construction, construction and operation.

The subproject is expected to bring about significant positive impacts, particularly improvement of urban connectivity by constructing the main road connecting urban centers, improving environmental sanitation by construction of wastewater collection and treatment system. Tri river dredging and embankment lining will help to reduce flooding risk for residential areas along the river and improve drainage capacity for the river basin. Thuy Son lake embankment lining and dredging will contribute to improve environmental condition and landcape of the town's central area, improving local drainage capacity. Beside the positive impacts, there would be also some potential negative impacts and risks during the pre-construction, construction and operation of the facilities provided under the Subproject. Most of these potential impacts and risks has been predicted to be at low to moderate levels, localised as these would be taking place in areas around construction sites and/or on transport routes and at disposal sites. These impacts and risks can be managed by the implementation of the Environmental and Social Management Plan, taking into account the feedback received during public consultation on ESIA/ESMP.

This subporoject would bring about significant positive environmental benefits, contributing to the sustainable growth of Ky Anh town and in particularly helping the town to achieve several key targets for becoming the class III urban by 2020. Therefore, the subproject should be implemented.

INTRODUCTION

1. Project Background

Viet Nam has set the goal to have urban development together with complete, modern and environmental-friendly technical infrastructure system. The Prime Minister has approved many important orientations to promote cities development following plans, such as the Masterplan for Vietnam's Urban Development under the Decision No.445/QD-TTg dated 07/04/2009, the National Urban Upgrading Program for the period from 2009 to 2020 under Decision No. 758/QD-TTg dated 08/06/2009, the National Urban Upgrading Program for the period 2012-2020 under the Decision No. 1659/QD-TTg dated 07/11/2012. These are the basis for formation of the country's large urban areas with socio-economic development.

Over the past years, Government of Vietnam with the assistance of the World Bank has implemented numbers of urban development projects such as the Vietnam Urban Upgrading project, Medium Cities Development Project etc which are bringing great benefits with positive changes in urban landscapes and people's awareness about urban and project management in the participating cities.

In order to implement the masterplans and development policy of the Government, the **Dynamic Cities Integrated Development Project** has been proposed with five cities included: Hai Duong city (Hai Duong province), Tinh Gia (Thanh Hoa Province), Yen Bai city (Yen Bai Province), Thai Nguyen city (Thai Nguyen Province) and Ky Anh town (Ha Tinh province). The ***Ky Anh subproject, Ha Tinh province*** includes two components:

- Component 1: Construction of Technical and Urban Transport Infrastructure
- Component 2: Technical Assistance and Implementation Support.

The map in Figure 1 below shows the locations of the five DCIDP provinces.

Figure 1: Location Map of DCIDP Provinces

2. Relationships between the Project and Masterplans

The project will comply with the master plan of Ky Anh Town, Ha Tinh province to 2035. According to this plan, Ky Anh town will be the general economic center in the South of Ha Tinh province, playing an important role in promoting the socio-economic development of the North Central region.

Figure 2: Main Urban Operation Structure

❖ **Orientations of The Spatial Development Plan of Ky Anh Town:**

- To organize and exploit inter-regional geographycal roles of the town in relations with the neighborhoods, through external transport systems and urban main roads.
- To prioritize development of port and industry in the northeast of national highway 1A.
- To arrange infrastructures for professional education, vocational training and technology transfer research or high technology in South area of Ky Trinh (south of Mau mountain).
- The area of Song Tri river (former Ky Anh townlet) continues to be renovated, upgraded, and uses landscape at the sides of Tri River and around Nguyen Trong Binh park to organize service urban areas.
- To develop central urban area in Ky Trinh ward, including new administrative center of the town; to adjust some roads and spatial plan in accordance with the demand for spatial development but still reserving water drainage corridor and tree system, agricultural ecosystem for water drainage.
- To develop new urban areas to the south of national Highway 1A, combined with the renovation of residential areas along the national highway 1A and resettlement areas.
- To upgrade and develop Ky Ninh tourism urban area, Ky Ha area and Ky Nam ecotourism in combination with reserving agricultural production activities and aquacultural farming.
- To organize parks and sports center in the south of Moc Huong lake, to rehabilitate area surrounding Moc Huong lake and the south of the national highway 1A.
- To develop land budget in the south of National highway 1A, develop auxiliary and multi-sectoral industries, agricultural and forestry production farms.

- Ky Hung and Ky Hoa communes are planned to be suburban communes but have closed link with the town's spatial development pland and are connected with Song Tri and Ky Trinh wards.
- To study the relation and connection of new rural areas in adjacents communes in Ky Anh district for spatial planning of Ky Ha, Song Tri, Ky Hung and Ky Hoa areas to ensure convenient connections with these communes.

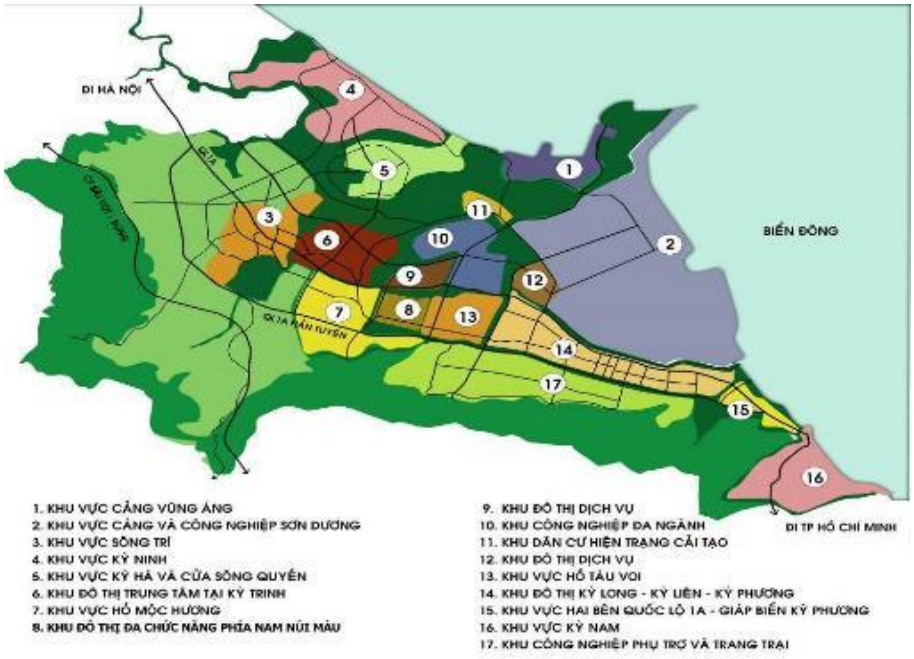


Figure 3: Ky Anh Town's Land Use Planning

The key challenges to be addressed in Ky Anh town's masterplan include:

- Urban transport system is inadequate, lack of inter-regional road systems, lack of collector road and internal road system. Inter-regional roads are small, lack of technical infrastructure.
- Drainage system is not separate from sewer and is not fully invested. There are some important areas getting localized inundation, affecting people's life. Stagnant water at some central areas of the town has not been solved thoroughly affecting living condition of people.
- The collection system and wastewater treatment is not invested, affecting people's living environment

Solutions to address the "hot" challenges:

The prioritized investment to be included in the "Dynamic Cities Integrated Development Project – Ky Anh town subproject" using World Bank's fund will help to solve infrastructure weaknesses in Ky Anh town and improve environmental sanitation for the whole town (through work items such as road to improve connectivity, wastewater collection and treatment plants).

3 Technical and Legal Basis for the Preparation of ESIA

The proposed Project will be compliance with current legal regulations of the Government of Viet Nam and the World Bank safeguard policies. Component 2 of the project is technical assistance, not including construction work so the ESIA report will focus on Component 1.

3.1 Vietnamese Legal Documents

- The Law on Environmental Protection No.55/2014/QH13 was approved by the National Assembly of the Socialist Republic of Vietnam (session XIII) on 23/6/2014 and became effective since 01/01/2015;

  The Law on Environmental Protection (No. 55/2014/QH13) dated 23/6/2014 and the Decree No. 18/2015/NĐ-CP) dated 14/2/2015 on Environmental Protection Planning, Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Plan are important legal frameworks for environmental management in Vietnam. The Law on Environmental Protection provides legal provisions on environmental protection; measures and resources used for environmental protection purposes; the powers, obligations and responsibilities of agencies, organizations, households and individuals in environmental protection. The Law on Environmental Protection regulates the strategic environmental assessment, environmental impact assessment and environmental protection commitment. In addition, the Law also regulates the affected community consultation in the process making Environmental Impact Assessment Report of projects (Article 21, Section 3, Chapter 2).

  The Environmental Impact Assessment will be submitted to the Ministry of Natural Resources and Enviroment for consideration and approval.

- Law on Construction No.50/2014/QH13 passed by National Assembly Session XIII of the Socialist Republic of Vietnam on 18 June 2014 and took effect on 01/01/2015; The Law on modification and amendments of a number of articles of the Law on Inland Waterway Navigation No. 48/2014/QH13 passed by the National Assembly Session XIII of the Socialist Republic of Vietnam, on 17 June 2014;
- Land Law No. 45/2013/QH13 of the National Assembly of Vietnam dated November 29, 2013, taking effect since 01/7/2014.
- Law on Water Resources No. 17/2012/QH13 of the National Assembly of Vietnam dated June 21, 2012
- Labor Code 10/2012/QH13 dated 18/06/2012 approved by Socialist Republic of Vietnam National Assembly Session XIII dated 18/06/2012;
- Law on Urban Planning No. 30/2009/QH12 approved by Socialist Republic of Vietnam National Assembly Session XII dated 17/06/2009;
- Law on Biodiversity No. 20/2008/QH12 of the National Assembly of Vietnam dated November 13, 2008
- Law on Chemical No.06/2007/QH127 approved by Socialist Republic of Vietnam National Assembly Session XII dated 21/11/2007;
- Law on modification and amendments of some articles of Law on Fire Protection No.40/2013/QH13 approved by Socialist Republic of Vietnam National Assembly Session XIII dated 22/11/2013.
- The Law on Road Transport No. 23/2008/QH12 dated on 13/11/2008.
- The Law on Standard and technical regulations No.68/2006/QH11 approved by Socialist Republic of Vietnam National Assembly session XI on 29/6/2006;
- The Law on Inland Waterway Transport No. 23/2004/QH11 approved by the National Assembly Session XI of the Socialist Republic of Vietnam dated June 15, 2004;
- The Law on People's Health Protection No. 21/LCT/HDNN8 approved on June 30, 1989 by the National Assembly Session VIII of the Socialist Republic of Vietnam.

- Decree 59/2015/ND-CP dated 18/6/2015 by the Government on management of construction investment projects;
- Decree No. 18/2015/ND-CP dated February 14, 2015 by the Government on environmental protection planning, strategic environmental assessment, environmental impact assessment, and environmental protection commitment.
- Decree No.19/2015/ND-CP of 14 February 2015 by the Government detailing the implementation of a number of articles of the Law on Environmental Protection;
- Decree No.38/2015/NĐ-CP dated 24/4/2015 by the Government on waste management;
- Decree No.42/2017/NĐ-CP dated April 05, 2017 by the Government on amending and supplementing some articles of Decree No. 59/2015/NĐ-CP dated 18/06/2015 by the Government on management of construction investment works;
- Decree No.43/2014/ND-CP dated May 15, 2014 by the Government providing guidance on detailed implementation of some articles from the Land Law 2013.
- Decree No.44/2014/ND-CP dated 15 May 2014 by the Government providing regulations on land prices.
- Decree No.45/2014/NĐ-CP dated 15/5/2014 by the Government on land use levy;
- Decree No 46/2014/NĐ-CP dated 15/5/2014 by the Government on collection of land rent and water surface rent fee;
- Decree No.47/2014/ND-CP dated 15 May 2014 by the Government on compensation, support, and resettlement when land acquisition is required by the State.
- Decree 80/2014/ND-CP dated 06/8/2014 by the Government on water drainage and wastewater treatment;
- Decree No.155/2016/ND-CP dated 18/11/2016 by the Government on the penalties for administrative violations against the law on environmental protection
- Decree No.154/2016/ND-CP dated 16/11/2016 by the Government on environmental protection charges for wastewater;
- Decree No. 38/2015/ND-CP dated 24 April 2015 issued by the Government on solid waste management;
- Decree No. 149/2004/ND-CP dated 27 July 2004 regulating the licensing of water resource exploration, exploitation and use, and discharge of wastewater into water sources.
- Decree No. 38/2011/ND-CP by the Government amending and supplementing a number of articles on administrative procedures of Decree No. 181/2004/ND-CP dated October 29, 2004, Decree No. 149/2004/ND-CP dated July 27, 2004 and Decree No. 160/2005/ND-CP dated December 27, 2005.
- Circular No. 27/2015/TT-BTNMT dated 19 May 2015 of the Ministry of Natural Resources and Environment on strategic environmental assessment, environmental impact assessment, and environmental protection plan.
- Circular No. 36/2014/TT-BTNMT dated 30 June 2014, specifying detailed methods of valuation of land prices, construction, adjustment of land prices; specific land prices valuation and land prices valuation consulting service.
- Circular No. 32/2015/TT-BTNMT dated July 24, 2015 of the Ministry of Transport regulating environmental protection in the development of transport infrastructure;
- Circular No. 36/2015/TT-BTNMT dated 30 June 2015 on the management of hazardous

waste;

- Circular No. 32/2013/TT-BTNMT dated 25/10/2013 of MONRE on the promulgation of national technical regulations on environment;
- Circular 21/2012/TT-BTNMT dated 19/12/2012 regulating quality assurance and quality control in environmental monitoring;
- Circular No. 19/2011/TT - BYT of 06 June 2011 of the Minsitry of Health guiding labor hygiene, laborers' health and occupational diseases.
- Circular No. 22/2010/TT-BXD dated 03/12/2010 of Ministry of construction providing labor safety in construction
- Circular No. 16/2009/BTNMT and 25/2009/BTNMT of the MONRE on promulgation of Vietnam National Standards;
- Circular 02/2009/TT-BTNMT dated March 19, 2009 of the Ministry of Natural Resources and Environment on the regulation on evaluation of water source to receive wastewater;
- Circular No. 10/2007/TT-BTNMT dated October 22, 2007 guiding for Quality Assurance and Quality Control in Environmental Monitoring;
- Decision No. 16/2008/QĐ-BTNMT dated 31/12/2008 of the Ministry of Natural Resources and Environment on promulgation of national technical regulations on environment;
- Decision No. 22/2006/QD-BTNMT dated 18/12/2006 of the Ministry of Natural Resources and Environment mandating the application of Vietnam standards on environment

Applied Standards and Codes:

Preparation of the ESIA applies following current National technical regulations (QCVN):

❖ Water quality

QCVN 01:2009/BYT: National technical regulation on drinking water quality.

QCVN 08-MT:2015/BTNMT– National technical regulation on surface water quality;

QCVN 09-MT 2015/BTNMT– National technical regulation on ground water quality.

QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater.

QCVN 40:2011/BTNMT: National technical regulation on industrial wastewater.

❖ Air quality

QCVN 05:2013/BTNMT: National technical regulation on ambient air quality.

QCVN 06:2009/BTNMT: National technical regulation on hazardous substances in ambient air.

TCVN 6438:2005 - Road vehicles –Maximum allowable limits of gas emission

❖ Soil quality and sediment

QCVN 03-MT:2015/BTNTM - National technical regulation on the allowable limits of heavy metals in the soils.

QCVN 15:2008/BTNMT: National technical regulation on the pesticide residues in the soils.

QCVN 43:2012/BTNMT - National technical regulation on sediment quality in fresh water areas.

❖ Noise and vibration

QCVN 26:2010/BTNMT: National technical regulation on noise.

TCVN 5948:1999 - Acoustic - Noise emitted by accelerating road vehicles - Permitted maximum noise level.

QCVN 27:2010/BTNMT: National technical regulation on vibration.

❖ Water drainage and supply

TCVN 7957:2008 - Drainage and sewerage - External Networks and Facilities - Design Standard

TCXDVN 33:2006 - Water Supply - Distribution System and Facilities.

❖ Safety and occupational health

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

Legal Documents Related to The Project:

- Decision No. 758/QD-Ttg dated June 8, 2009 of the Prime Minister approving the national program on the upgrading of urban centers during 2009-2020;
- Decision No. 1659/QD-Ttg dated November 7, 2012 of the Prime Minister approving the national development program on the upgrading of urban centers during 2012-2020;
- Decision No. 445/QD-Ttg dated April 7, 2009 of the Prime Minister on approving the modification of the master plan for development of Vietnam's urban system by 2025 and vision to 2050;
- Decision No. 2623/QD-TTg dated December 31, 2013 of the Prime Minister on approval of the scheme "Vietnam's urban development for response to climate change in 2013-2020 period";
- Decision No. 403/QD-TTg dated 2014 of the Prime Minister on approval for the national action plan on green growth;
- Decision No. 1810/QD-TTg dated October 4, 2013 of the Prime Minister on approving the orientation and criteria for using WB's capital in 2014-2018 period and in the following years;
- Decision No. 4226/QĐ-UBND dated 26/12/2014 by Ha Tinh PPC approving the Regional planning of Ha Tinh province to 2030 and vision to 2050; Decision No. 528/QĐ-UBND dated 23/01/2017 by Ha Tinh PPC approving the urban development program of Ha Tinh province in period 2016 - 2030;
- Decision No.938/QĐ-UBND dated 10/4/2017 by Ha Tinh PPC assigning the task for preparing and implementing the Dynamic Cities Integrated Development project – Ky Anh town subproject funded by World Bank;
- Document No. 28/HĐND dated 29/5/2017 by Ky Anh town People's Standing Councile approving the Investment Policy proposal of Dynamic Cities Integrated Development Project – Ky Anh town subproject
- Document No. 2318/ VPCP-QHQT dated 14/03/2017 by Office of Government approving the proposal of the Dynamic Cities Integrated Develoment Project funded by World Bank;
- Memoradum of Understanding of World Bank's Task teams.

3.2 World Bank's Environmental and Social Safeguard Policies

The Project has been classified as a environmental category B by the World Bank, i.e. most of the potential impacts and risks would be at low to moderate level, and manageable. The project's Environmental and Social Impact Assessment (ESIA) has been prepared to determine and evaluate social and environmental impacts and risks. Then , the Environmental and Social Management Plan (ESMP) has been also be prepared to propose measures for mitigation and management of the identified potential impacts and risks.

The World Bank's operational policies triggered inthis project include:

OP/BP 4.01[1]*: Environmental Assessment;*

OP/BP 4.04[2]*: Natural Habitats;*

OP/BP 4.11[3]*: Physical Cultural Resources;*

OP/BP 4.12[4]*: Involuntary Resettlement;*

OP/BP 4.01 – Environmental Assessment

This policy requires the social and environmental impacts and risks are screened from early stage of Project preparation in order to propose appropriate mitigation measures and management plan to minimize the negative adverse impacts during the project implementation.

To comply with OP 4.01's requirement, an Environmental and Social Impact Assessment (this report) has been prepared to assess the project's potential impacts and risks, and to propose necessary measures to prevent, minimize or compensate for adverse impacts. The Environmental and Social Management Plan (ESMP) will also be prepared for the project to propose specific plan for implementing, monitoring and reporting the implementation of proposed mitigation measures.

The OP/BP 4.01 also requires that the affected communities are consulted during the preparation of the ESIA/ESMP. The ESIA/ESMP reports have to be disclosed locally for public access prior to project appraisal.

Natural Habitats (OP/BP 4.04);

The subproject will be implemented in urban areas and will not involve significant conversion or degradation of critical natural habitats or other natural habitats. However, as some civil works such as river embankment lining or the construction of bridges would be implemented at riverside or on river bed thus the project would cause loss or damages to some riverside vegetations or benthics, negatively affecting the habitats of some terrestrial or aquatic species. The potential impacts and their associated mitigation measures have been identified and addressed in the subproject ESIA and ESMP.

[1]Detailed information on OP/BP 4.01 can be found at WB website.
[2]Detailed information on OP/BP 4.04 is presented on http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20543920~menuPK:1286576~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html
[3]*OP/BP 4.11 is presented on http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20543961~menuPK:1286639~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html*
[4]Detailed information on OP/BP 4.12 is provided on World Bank's website :http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTSAFEPOL/0,,contentMDK:20543978~menuPK:1286647~pagePK:64168445~piPK:64168309~theSitePK:584435,00.html

Physical Cultural Resources (OP/BP 4.11)

This policy aims at avoiding impacts on physical cultural resources such as, historical relics, pagoda, temple, monuments, worshiping places, structures and objects spiritually important to local communities etc... This Policy is triggered under the Project due to relative large volume of excavation will be involved, some graves and a family worshipping house will be relocated. Chance find procedures and appropriate mitigation measures will be proposed under the ESMP for implementation.

Involuntary Resettlement (OP/BP 4.12)

This policy aims to avoid involuntary resettlement to the extent possible or to minimize and mitigate its adverse social and economic impacts. The policy proposes a livelihood restoration program to ensure the affected households will restore their livelihood to the project living standards or even improved. This project will have to acquire residential land, agricultural land of the local people and relocate some affected households. Therefore, the OP/BP 4.12 will be implemented and mentioned in the Resettlement Plan (RP) for this project.

In addition, the project will also follow the *World Bank Guidelines on Environmental, Health and Safety*[5] (1998).

The project will not affect wet land and natural reserve areas or not generate insoluble organic pollutants or relate to international trading of endangered species. So no international environmental agreements of which Viet Nam is member would be applied to the Project.

4 ESIA Implementation Arrangement

The Ky Anh Project Management Unit has contracted the consultants from the International Engineering Consultant Joint-stock company (INTEC) to prepare the Environmental and Social Impact Assessment report for Ky Anh town subproject in 2017. The ESIA team members are presented in Table 1 as follows.

Table 1: List of ESIA Team Members

NO	Full name	Educational background	Involvement in ESIA preparation
1	Phùng Công Thành	BS. Environmental Science	ESIA team leader, assess environmental impacts and recommend mitigation measures.
2	Phan Thị Hằng	BS. Environmental Science	Conduct surveys to collect information on natural and socio-economic baselines in the project areas
3	Nguyễn Minh Chính	BS. Environmental Science	Analyze and assess construction methods proposed for the project works. Prepare an environmental monitoring and management program
4	Lê Thị Phương Khanh	Environmental Engineer	Evaluate existing environmental and socio-economic baselines of the project areas.
5	Trần Thị Ngọc	Bachelor degree in Sociology	Surveying team leader, conduct public consultations, write content related to local existing economic condition and affected households.

5 Methods for Environmental and Social Impact Assessment

5.1 Method for Environmental Impact Assessment

Field research method: survey and research existing status of environmental resources. Study and select locations, parameters, methods of monitoring and sampling soil, sediment, surface water, groundwater, wastewater, and air within the project area.

Sociological Investigation and Public Consultation: This is a participatory method for assessing stakeholder engagement and community involvement in project implementation. To commence public consultation, Consultant will organize public consultation meetings and group discussions in all areas where the project's construction are carried out, ensuring that there are presence of all representatives of directly affected people, indirectly affected people, the management agency; participants in the project construction, other organizations and individuals, etc. The consultations are conducted twice:

- First time: To determine the scope of impact, introduce the project, preliminarily evaluate the environmental impact of the project activities, ask for comments on mitigation measures and identify unforseen environmental issues in the project area.
- Second time: To complete the draft ESIA report: To report and discuss ESIA results and to collect feedback and agree on the results of the environmental impact assessment of the project.

During consultation process, Consultant informs people about possible negative environmental impacts during project implementation, proposes mitigation measures to mitigate those effects. Governments and people in the affected area will provide comments on the environmental issues raised and mitigation measures to be taken.

Statistical method: to collect, process and analyze meteorological, hydrological and environmental data for many years in the project area.

Inheritance method: To inherit the research results of the relevant projects.

Expert method: the consultant has participated in and held meetings and discussions to collect comments and proposal on mitigation measures for negative impacts of the project with environmental experts, soociologist, ...

Inheritance method: To inherit the research results of the relevant projects.

Expert method: the consultant has participated in and held meetings and discussions to collect comments and proposal on mitigation measures for negative impacts of the project with environmental experts, soociologist, ...

Synthetic and analysis method: To analyse and synthesize project impacts on natural environment and socio-economic condition in the project area.

Rapid assessment method: is the assessment method based on emission factor. The rapid assessment method is at high efficiency in determining the pollutant concentration and emissions from the use of machinery and the operation of the material transportation vehicles; concentration of water pollution caused by wastewater generated from daily activities of workers during construction of the project; Water pollution due to operation of the works during project operation. With the rapid assessment method, it is able to forecast environmental impact of the pollution sources and to forecast the amount of pollutant discharge from the source.

Comparing method: To evaluate the impacts by comparing the results of measurement, analysis and calculation of the predicted concentration of pollutants due to the project's

activities with the allowable value in Vietnam National standards on soil quality, water, noise, air quality and sectoral standards approved by Ministry of Health, Ministry of Construction.

Matrix Method: A matrix is made up by comparing every activity of the project with each parameter or environmental component to assess cause and effect relationship. The matrix method is very valuable for determining the impact of the project and providing a summary form of impact assessment. This is a simple, easy-to-use method that does not require a lot of environmental data, but can clearly analyze a variety of activities on the same element. Using the environmental matrix method can clearly see the relationship between development and the environment.

Monitoring, sampling and analysing method of the baseline environment: Based on the project activities as well as the process of surveying the actual area of the project, the report carries out monitoring and sampling for analyzing existing status of the baseline environment of the project area to form the rationale for proposing mitigation measures as well as environmental management and monitoring plans when the project is implemented. The environmental components selected for monitoring and sampling include:

Environmental monitoring of soil, surface water and groundwater is carried out in accordance with the following guidelines/standards:

Ambient air monitoring: Circular 28/2011/TT-BTNMT regulates the monitoring process for surrounding ambient air and noise.

Surface water and sediment monitoring: Circular No. 29/2011/TT-BTNMT regulates the technical process of surface water monitoring.

Underground water monitoring: Circular No. 30/2011/TT-BTNMT regulates the technical process of monitoring underground water environment.

Soil environment monitoring: Circular No. 33/2011/TT-BTNMT regulates the technical process for soil monitoring procedures.

The samples are taken at the site, stored and brought to the standard laboratory for analysis of specific environmental parameters. The analysing methods are applied in accordance with the standards/regulations issued by Vietnam.

5.2 Method for Social Impact Assessment

Data surveying and collecting

After the mentioned screening process, a framework and surveying method will be discussed to determine the appropriate sample size, technique/method of data collection. Two main survey techniques are selected, including: (i) using sample forms for the local authorities of the project wards/communes; (ii) surveying for analyzing socio-economic information of households.

Secondary data collection

Information and data related to the project are collected from the Development Project Management Unit and from other socio-economic analyzing sources such as the Statistical Yearbook of Ha Tinh province, Socio-economic conditions of the province/district/commune and poverty analysis related to ethnic minority groups.

Quantitative research method

A socio-economic survey is conducted to document the personal profile of people in the project area, relating to affected households and beneficiaries (or both). The socio-economic survey was conducted in May 2017.

Qualitative research method

Qualitative research is conducted in the form of in-depth interviews with key informants including: (a) head of residential group/village, (b) leader of commune/ward People's Committee, (c) households in the project area and (d) affected households and beneficiary households. The purpose of the in-depth interviews is to collect ideas and desires of people in the project area in order to provide appropriate solutions to resolve potential conflicts and identify measures to mitigate the negative impacts of the project. .

Public consultation

Public consultation meetings in the project wards/communes are organized with the participation of the following stakeholders:

- Representatives of local authorities from the project wards/communes;
- Mass organizations: Fatherland Front, Women's Union, Youth Union, Farmers' Association, Veteran's Association of project wards/communes.
- Representatives of households in the project area include potentially affected households, beneficiaries,.

Issues to be discussed by the Consultant include: (i) Introduction on the project components and work items; (ii) Overview on local socio-economic condition; (iii) Current status of infrastructure system in residential areas including technical infrastructure and social infrastructure: electricity, roads, schools, health stations; (iv) Demand for investment in construction and improvement of local infrastructure; (v) Screening/evaluating potential impacts that may occur during the construction phase and may affect the socio-economic consition and cultural life of people in the project area. (Details on information dissemination, consultation and participation are covered in section 7 of this document.)

CHAPTER 1. PROJECT DESCRIPTION

1.1 General Information

Project's name in Vietnamese:	**Dự án phát triển Tổng hợp các đô thị động lực – Tiểu dự án đô thị Kỳ Anh, tỉnh Hà Tĩnh**
Project's name in English:	**Dynamic Cities Integrated Development Project (DCIDP)Ky Anh Subproject**
Donor:	The World Bank
Executive agency:	Ha Tinh Provincial People's Committee
Project's owner:	Ky Anh town People's committee
Project owner representative:	Ky Anh town Project Management Unit
Address:	Road 3/2, Song Tri ward, Ky Anh town, Ha Tinh province
Telephone/Fax:	(8491) 2999 123, Email: pmutxka@gmail.com

The project includes two components:

- Component 1: Construction of technical and urban road infrastructure
- Component 2: Technical assistance and implementation support

Component 2 is technical assistance with no construction work so the report will focus on analyzing environmental and social impacts caused by work items in Component 1.

1.1.1 Project Objectives

❖ **Project objectives:**

General objectives: The Project's general objective is to support the important and potential urban areas to become provincial and regional center of urban economic development. Along with the twin goals of reducing extreme poverty and promoting common prosperity, this activity is designed to:

- To address the challenges of economic growth and urban development which the selected urbans are facing.
- To increase the accessibility and reliability of urban services for 40% of the population with difficulities ;
- To support the economic growth of the selected urban ;
- To strengthen institutional capability for management and operation of the improved urban planning.

Specific objectives:

- To strengthen connectivity between the industrial parks, urban center of Ky Trinh and the southern area of Ky Anh district to support the sustainable development of Vung Ang economic zone by investing in the construction of the arterial roads connecting the central city.
- To develop urban space, aiming to create a motive force for development of multi-purpose city, attracting more investment.
- To improve living environment and improve the quality of urban services, through the construction of the waste water collection and treatment system, lining the embankments of the

Song Tri river, upgrading the Thuy Son lake and construction of a new road crossing the centre area of Ky Anh town.

1.1.2 Project Location

The Ky Anh sub-project will be implemented in two wards namely Song Tri and Ky Trinh, and two communes namely Ky Hoa and Ky Hung of Ky Anh town – Ha Tinh province. The sub-project has total land area of 9,989 ha and population of 22,774 people.

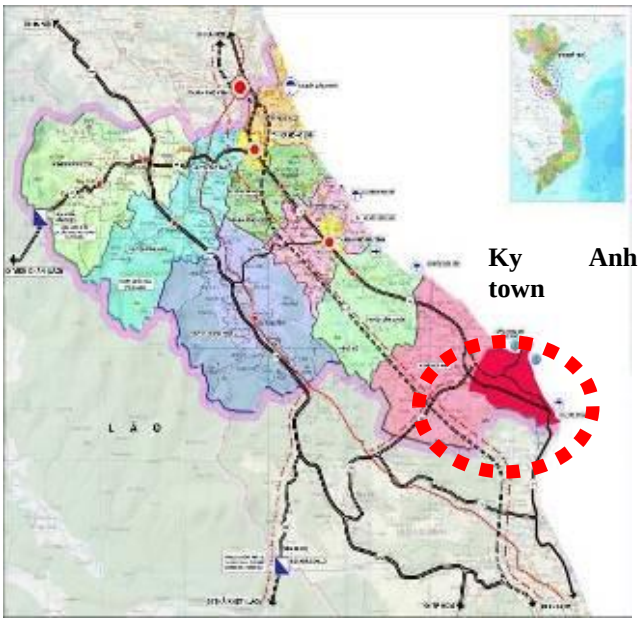
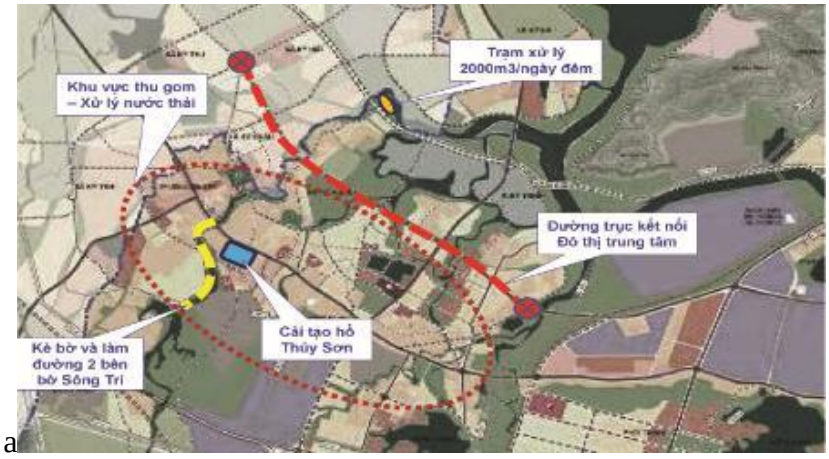


Figure 4: Sub-project Location

1.2 Scope of Investment

Component 1 covers four work items of which locations are shown in Figure 5. General information about each item are listed in the Table 2.



a

Figure 5: Map of Investment Items of Project

Table 2: Scope of Project Investment

Work items	Description
Component 1: Construction of technical and urban roads infrastructure	
Construction of trunk road connecting urban centers	Construct 3.75 km new urban road crossing Ky Trinh, Ky Hung and Ky Chau communes. The new road starts at the junction with the road to Formosa IZ and ends at the junction with Nguyen Thi Bich Chau road. Design speed V = 60km/h. Road construction include basic infrastructure such as drainage, sewers, lighting, roadside tree planting etc. The road includes three sections: **- Section 1: From Km0+00 to Km0+450, L= 450 m**, B =16 m, slope 1:1.5. - **Section 2: From Km0+450 to Km3+750, L= 3.3Km, B =** 20m, slope 1:1.5. This section includes construction of three new bridges, B = 16 to 20m, L = 58 to 83 m
Construction of wastewater collection and treatment system	Build a new wastewater collection and treatment system in Song Tri Ward, Ky Trinh ward and Ky Hoa and Ky Hung communes, including: - Wastewater Treatment Plant (WWTP) capacity Q = 2,000 m^3/day using biological pond technology. The WWTP has total land area of 5 ha, located in Ky Hung commune. Buffer zone is 300m radius. Treated wastewater will meet standard QCVN 14:2008/BTNMT - National technical regulation on domestic wastewater (Column B) and discharged into the Tri river. - 11 pumping stations, land area: 3 - 14m^2/station, H = 3 to 14 m - 39,582km of pipelines (including 34,922 km primary and secondary main line HDPE D300 ÷ D400, and 4.66 km tertiary pipeline).
Construction of Tri river embankment and operation roads	- Lining the left and right embankments along 1.5 km of the Tri river, from the existing weir to NH1A overpass crossing Tri river. The embankments will be lined with concrete slabs combined with cells for grass planting. - Build or upgrade the road on the top of the embankment, B = 13m ($B_{road\ surface}$ = 5.5m, sidewalk 6m wide at riverside and 1.5m wide at inland side). Road construction will include drainage, sewers, lighting, and trees.
Upgrading, rehabilitating Thuy Son lake	- Dredging Thuy Son lake with area 1.9ha, depth from existing 3m to 4.5m in Song Tri ward. - Constructing 2 km solid embankment around the lake and full technical infrastructure like lighting system, trees. - Improve water source by adding water conduit from the drainage system around the lake.

Each work items in Component 1 are described in detail below:

1.2.1 Construction of Trunk Road Connecting Urban Centers

The proposed trunk road connecting urban centers has total length of 3.75 km, B = 16 to 20 m, this is roadway grade II in plain area thus design speed is 60km/h. Starting from the intersection with the road to Formosa Industrial zone and ending at the intersection with Nguyen Thi Bich Chau road. Road construction include full technical infrastructure such as drainage, lighting, trees planting etc.

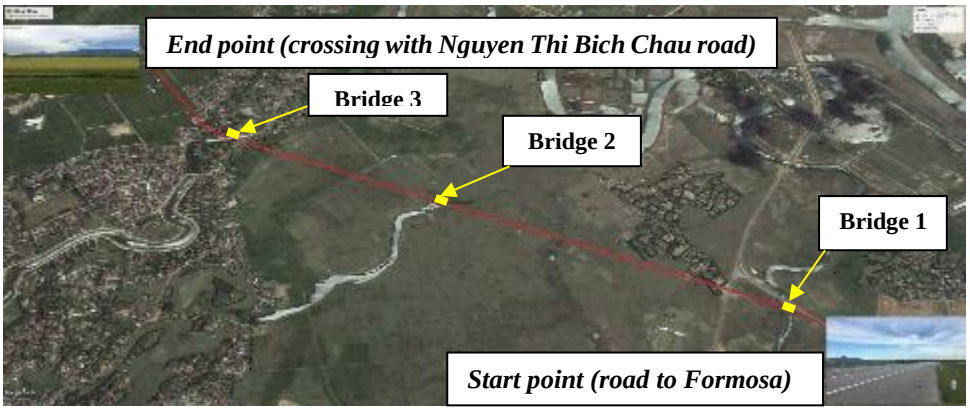


Figure 6: Layout on The Trunk Road Connecting Urban Centers

The road is divided into 2 sections:

- Section 1: From Km0+00 to Km0+450, L= 450 m, B = 16 m. The road is designed following Vietnamese standard TCVN 104-2007. B $_{\text{road surface}}$ = 2x7.5m = 15m, B $_{\text{road shoulder}}$ = 2x0.5m = 1m, slope 1:1.5.
- Section 2: From Km0+450 to Km3+750, L= 3.3Km, B = 20m, B roadsurfaace = 15m, road shoulder width 2x0.5m = 1m, road divicer is 4m wide, slope 1:1,5. Three new bridges will be built on this road.

The design cross section of the road sections and bridges are presented in Figure 7 bellow

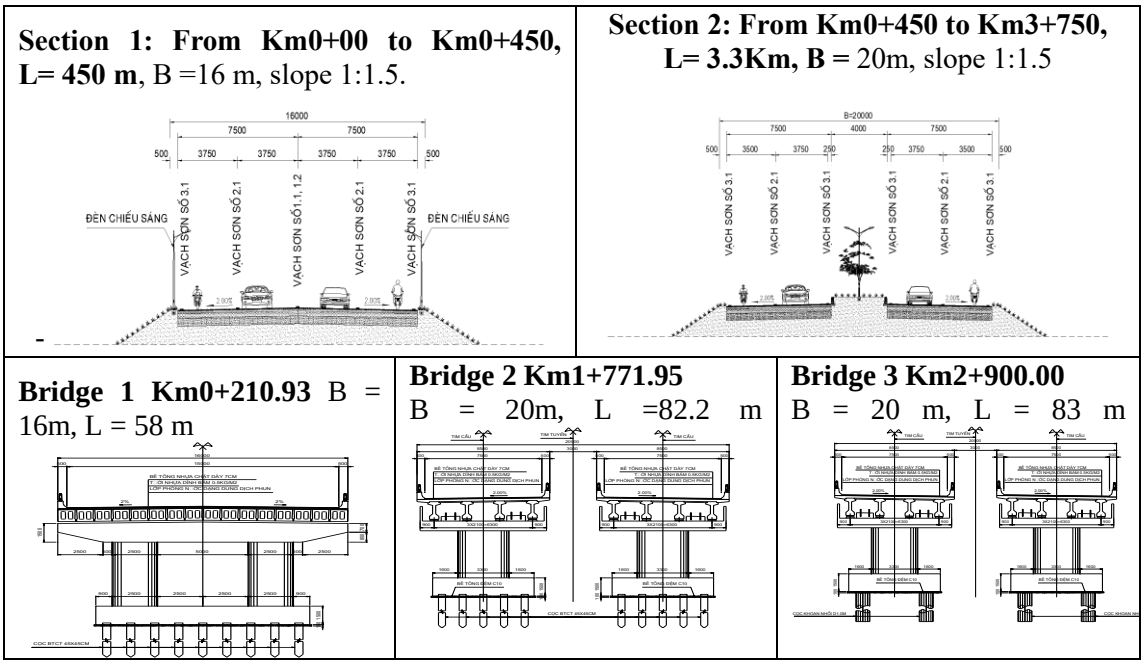


Figure 7: Design of Road and Bridge Cross-Sections

1.2.2 Construction of Wastewater Collection and Treatment System

The Ky Anh project will construct the wastewater collection and treatment system, including pipeline system, 11 pumping stations and a wastewater treatment plant.

- Pipeline system: total length of 34.922 km, main culverts HDPE D300 ÷ D400. The tertiary sewer line 4.66km long, UPVC D150 ÷ D250. The pipelines will be installed in Song Tri, Ky Trinh wards, Ky Hoa and Ky Hung 2 communes. The primary pipelines will be installed along NH 1A and the main concrete road of Ky Hung commune with total length of 34,922 km, D300. The secondary and tertiary pipeline will be installed along main roads of Ky Hoa, Song Tri, Ky Hung, Ky Trinh wards/communes. Figure 8 shows the diagram of sewer system.

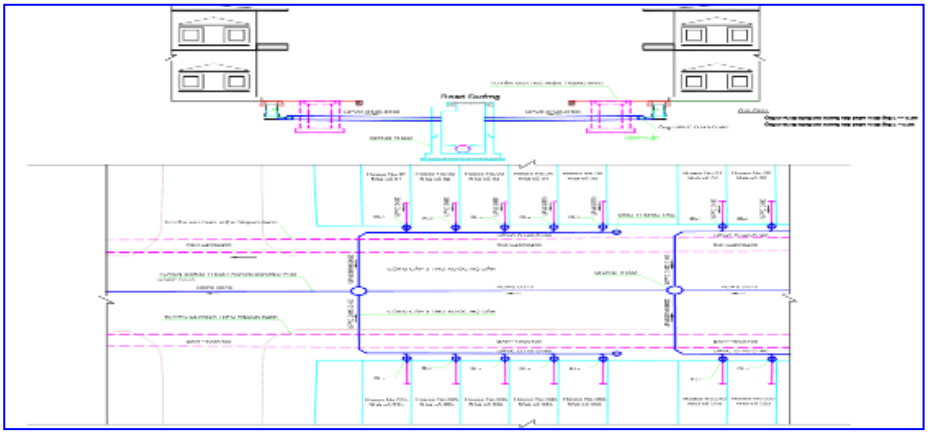


Figure 8: Household's Wastewater Collection Chart

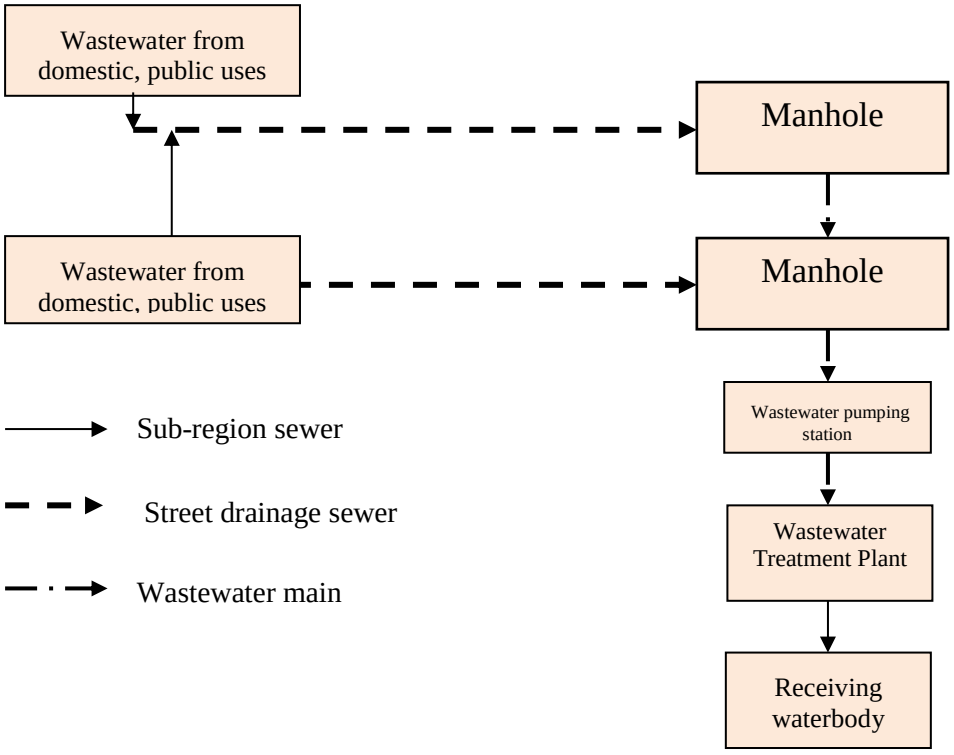


Figure 9: Wastewater Collection Chart

- Pumping stations: 11 booster pumping stations with pipe installed at depth not over 5-6m (depending on geological condition) will be built
- Wastewater treatment plant: The project will construct a Wastewater Treatment Plant (WTP) capacity 2,000 m3/d in Tran Phu hamlet and Hung Phu hamlet of Ky Hung commune. The construction area for the plant is 5ha. The WWTP has a buffer zone at 300m surrounding its

boundaries in accordance with Vietnamese standard TCVN 7222 :2002[6].. The maps showing the locations, layout of the WWTP and serviced areas are shown in Figure 10 below.

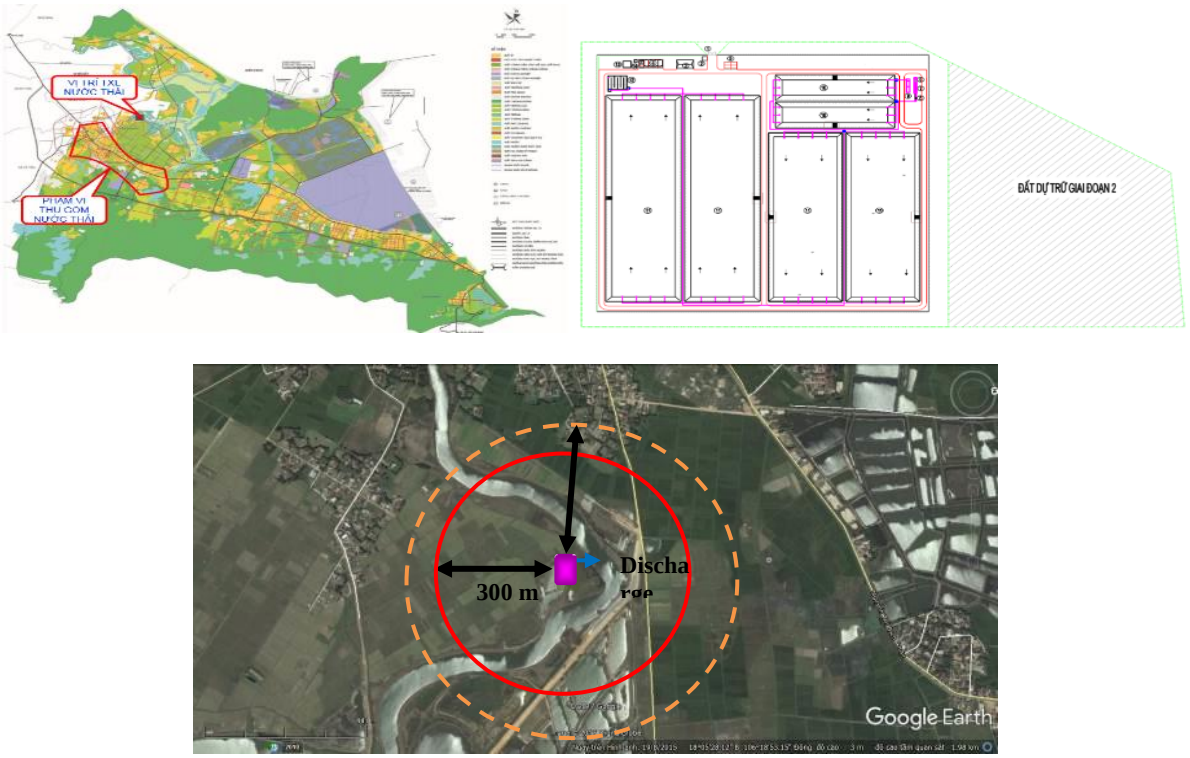


Figure 10: Location Maps and Layouts of the WWTP

Biological treatment technology will be applied to treated wastewater. Wastewater from sewers will be pumped to the pumping stations then the intake at the WWTP. Wastewater from the intake will run through screen and grit chamber to sedimentation tank; The screen and grit chamber hels to remove garbage in wastewater such as paper, plastic bags, tree barks and organic matter pieces. Sand will be deposited in the sedimentation tank before wastewater continues to run into biological ponds including anaerobic pond, primary and secondary facultative ponds.

- *Anaerobic pond*: From sedimentation tank, wastewater flow into anaerobic pond where suspended matters will be settled underanerobic condition. Average designed temperature of 16^{o}C to ensure effective treatment of wastewater by micro-organizm's. From anaerobic pond, wastewater is led to the primary then secondary facultative ponds.

- The *facultative ponds* operate in both anaerobic and aerobic conditions to continue settling remaing solids remained in wastewater after being treated in anaerobic pond.

- Wastewater after being treated by facultative ponds still contain bacterias. Therefore, wastewater will be sterilisedbefore being dischared into the receptor. Minimal detention time of wastewater in sterrilisation tank is 30 minutes.

Wastewater treatment process is presented in the Figure 11 below:

[6] TCVN 7222:2002: Environmental requirement for centralized wastewater treatment plants

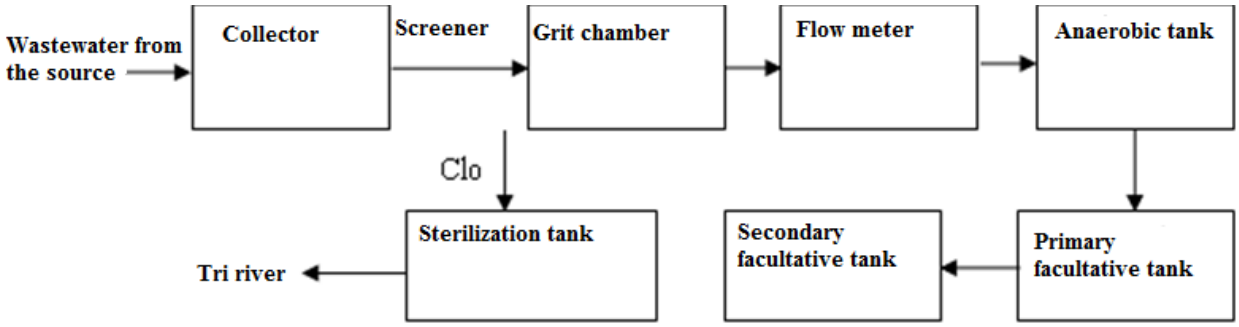


Figure 11: Wastewater Treatment Process

Treated watewater will meet Vietnamese National Standard QCVN 14 :2008 (Column B) and discharged into the Tri river as shown in Table 3 below.

Table 3: Treated Wastewater Quality (QCVN 14:2008)

No.	Parameters	Unit	QCVN 14:2008
1	BOD5 content	mg/l	50
2	Total suspended solids (TSS)	mg/l	100
3	Nitrate (NO_3^-) (calculated in N)	mg/l	50
4	Phosphate (PO_4^{3-})(calculated in P)	mg/l	10
5	Coliforms	MPN/100ml	5000

1.2.3 Tri River Embankment Lining and Construction of Operation Roads

Lining total 3 km embankments at both side of the Tri river with reinforced concrete slabs and grass confinements. Build operational road with B = 13m ($B_{roadsurface}$ = 5.5m, $B_{sidewalk}$ = 3 to 6m. Operational road constructionincludes lighting, drainage, sewers and trees. Design of the river embankment and side road is shown in Figure 12.

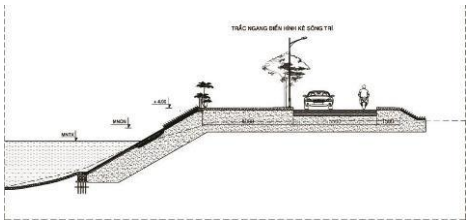


Figure 12: Tri River Embankment

1.2.4 Upgrading, Rehabilitation of Thuy Son Lake

This project will excavate and dredge the lake bed, construct additional water conduits for the lake and solid embankment, rehabilitate the existing sidewalk with drainage, lighting and tree planting. The lake embankment will be constructed by sand bags and retaining wall. The design of the lake embankment is showin in Figure 13.

Figure 13: Thuy Son Lake Embankment

1.3 Auxiliary Works

The auxiliary works for the project include access roads for construction plants, raw material transportation routes, worker camps, temporary storage facilities, borrow pits and quarries, temporary disposal sites. The locations of these anxiliary works are described below.

1.3.1 Access Roads to the Construction Sites

Construction sites of the trunk road will be accessible from Nguyen Thi Bich Chau Street, District Road 12a, National Highway 1 (NH1). The access roads to the construction sites of the WWTP will be NH1 and Ky Hung communal concrete road. The Tri River embankment lining and operational road construction sites will be accessible through NH1A, Le Quang Chi Street and existing roads along the two banks of the Tri River. For the Thuy Son Lake, access roads to the site will be Le Quang Chi Street and NH1A. These access roads are shown in Figure 14 below.

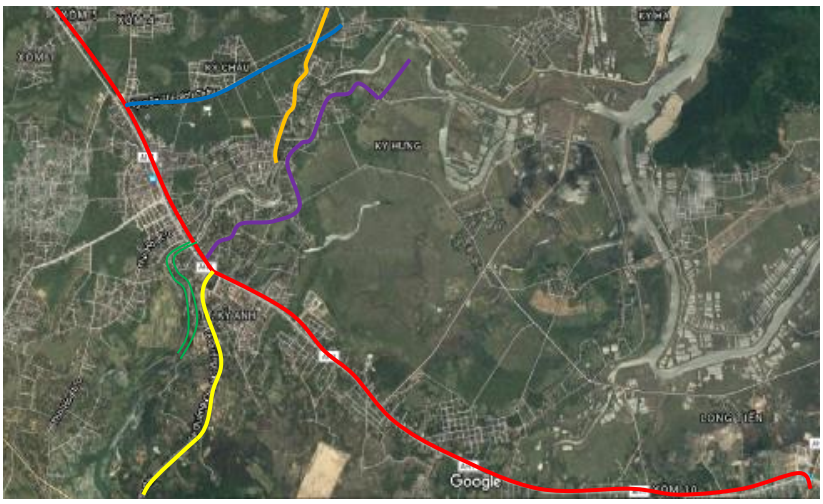


Figure 14: Access Road to The Construction Sitea

1.3.2 Worker's Camp

Worker camps will be set up for construction workers, construction contractors, supervisory managers and engineers. Warehouses will be used to store materials and construction equipment.

Table 4: Some Tentative Locations for Worker Camps

Work items	Location	Worker quantity	Scope of camp
Embankment of Tri river and Thuy Son lake	Near the start point at the left bank embankment of Tri river, 500m from Tri bridge	40 people	Constructing 01 camp of 60m^2
Main road connecting urban centers	Vacant land at the start point of the road, Km 0+00 and at Km 2+610	50 people	Constructing 02 camps, 50m^2/camp
Wastewater collection and treatment system	Constructing the vacant land in the treatment station.	50 people	Constructing 01 camp of 70m^2

1.4 Demand for Material

Material volume used for the project is listed in Table 5 below.

Table 5: List and Volume of main Construction Materials Mainly Used for The Project

Work Item	Cement concrete	Selected sand	Backfill soil K95, K98	Standard crushed stone	Mortar stone	Asphalt	Crush stone aggregate 1, 2	Backfill sand k95	Stone	Clay
	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)
Embankment for Tri river	7,654	600	1,977	3,060	1,260	817	2, 848			
Thuy Son lake	24	431	7,200	-	252	-	-		2704	
Central road	3,945	-	16,773	-	-	111,818	30,282			
Collection network			145,666					22,015		
Wastewater treatment system	677	126	13,377	302.6					*6,835*	*7,521*
Total	**12,299**	**1,157**	**184,993**	**3,363**	**1,512**	**112635**	**32,129**	**22,015**	**7,104**	**7,521**

1.5 Material Sources

Tentative quarries for the project are presented in Table 6.

Table 6: Proposed Material Quarries

Quarry name	Exploitation company	Material type	Location/ distance	Output (year)	Reserve	Exploitation permit	Environmental permit
Cup Coi borrow pit	171 Construction & Commercial JSC	Soil	Ky Hung comm., 6.5km	99,000	346,871	416/GP-UBND dated 15/2/2016 by Ha Tinh PPC	39/TB-UBND dated 13/7/2017 by Ky Anh town PC
Mui Doi borrow pit	Tuyet Anh construction material & commercial service Co., Ltd	Soil	Ky Trinh comm., 12.6km	98,000		226/GP-UBND dated 17/01/2014 by Ha Tinh PPC	3948/QĐ-UBND dated 12/10/2015 by Ha Tinh PPC.
Con Tria quarry	Hop Phuc JSC	Stone	Ky Tan comm., 10.2km	150,000	750,000	3490GP-UBND dated 26/11/2012 by Ha Tinh PPC	3378/QD-UBND dated 13/11/2012 by Ha Tinh PPC

These proposed existing quarries with legal permits. They all have great reserve sufficient to supply materials to infrastructure projects in Ha Tinh and neighbouring provinces. Therefore, the project will not need to open new quarries. During the project implementation, the contractor may propose other borrow pits and quarries based on the specifications of the detailed design.

Power supply: The contractor will work with the town's electricity authority to arrange for connection to the town' electricity existing network. Mobile generators are also prepared to be used as needed.

Oil and gasoline to operate construction machinery at construction sites are provided by local petroleum companies. With the available distribution network, the supply of fuel for the subproject is relatively convenient.

Water for construction and daily use is taken from local clean water source. The contractor will work with relevant authority for water supply connection.

1.5.1 Waste Generation and Disposal

Part of construction waste, particularly excavated materials, will be reused for backfilling at the pipe trenches. The remaining not reused solid waste will be disposed off at the pits created from stone exploitation in the Cup Coi quarry in Ky Hung commune, Ky Anh town. Domestic solid waste and hazardous waste will be collected by Ky Anh Construction Material and Urban Environment Management Joint-stock company for treatment.

- Excavated materials: According to the feasibility study, the total volume of excavated soil to be generated is about 70,218 m^3, it will be transported to Cup Coi borrow pit for leveling and backfilling.

- Dredged Materials: 65,202m^3 of dredged materials generated from dredging of Thuy Son lake and the Tri river embankment lining and construction are not hazardous so it will be transported together with the excavated soil to Cup Coi borrow pit for leveling and backfilling at the quarrry.

- *Domestic solid waste*: Daily domestic solid waste generated from workers camps will be stored in containers with lids. The contractor will contract with the Ky Anh Construction Material and Urban Environmental Management Joint Stock Company for domestic solid waste collection and transport to Hoanh Son Waste Treatment Plant.

- *Hazardous waste such as materials polluted with oil* will be collected and stored temporarily in the warehouse at the site. Then, the contractor will sign contract with a competent entity (possibly Ky Anh Construction Material and Urban Environmental Management JS Company) or eligible companies (defined in Circular 36/2015 dated 30 June 2015 by MONRE on management of hazardous waste) for collection and treatment.

1.5.2 Transportation Route

Roads for transportation of materials and wastes are Le Quang Chi, NH1A, Nguyen Thi Bich Chau, Ky Trinh – Ky Ninh and provincial road 10 which are presented in following map:

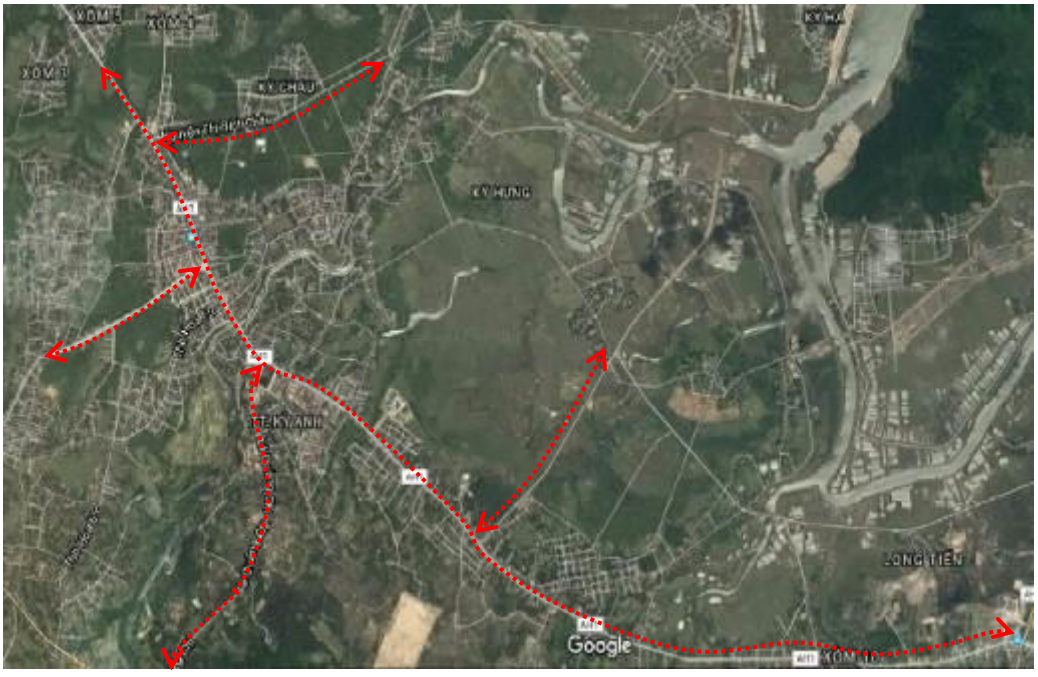


Figure 15: Main Road for Transportation of Material and Waste

1.6 Backfill and Excavation Volume

Demolition, backfill and excavation volume of the project's work items is presented in following table:

Table 7: Backfill, Excavation, Demolition and Dredging Volume

Work item	Demolition	Excavation	Backfill	Dredging
	m^3	m^3	m^3	m^3
Tri river embankment	14,642	31,681	159,074	14,285
Thuy Son lake	1,000	23,282	69,823	17,648
Main central road	4,881	10,560	106,049	4,762
Wastewater treatment plant	120	4,695	1,116	28,507
Total	**20,643**	**70,218**	**336,062**	**65,202**

1.7 Construction Method

1.7.1 Road Construction

1. Construction of road base:

- Clear the site
- Build embankments to prevent water from entering construction area, suck up water on the area for construction of roadbase;
- Filling and compact road base in layers
- Filling the sub-base

2. Construction of cross culvert:

- Dig up the foundation pit to designed depth, backfill the foundation by sand and place crushed-stone layer
- Install culvert foundation and pipes, construct culvert headwall, culvert joints and culvert wing wall.
- Install reinforcement and concrete the manhole.
- Backfill the foundation pit at two sides of the culvert
- Construct road pavement

3. Construction of road pavement (road surface):

- Construct the lower crushed stone aggregate
- Construct the upper crushed stone aggregate
- Prime coating and paving the lower asphalt concrete layer
- Prime coating and payving the upper asphalt concrete layer.

4. Finishing

- Planting grass on slope
- Installing signages and painting marks.

b. Bridge Construction

1. Abutment Construction: Levelling and installation of equipment for bored drilling; bored drilling, stabilizing the borehole with the borehole wall and clay mixture, cleaning of the borehole; placing the steel cage using a crane, pouring the concrete following the underwater concretization

method. Excavating soils for the abutment foundation to the designed depth, constructing a pile base, pouring and flatting the concrete base, placing the frame, steel foundation. Install scaffolding and steel cage for the abutment wall, wingwall, pouring concrete, removing the falsework structure and completing the abutment.

- Terrestrial abutment: (1) For abutment with foundation on bored piles, the construction method is: levelling and installation of equipment for bored pile drilling, bored drilling, stabilizing the borehole with the borehole wall and clay mixture, cleaning the borehole, placing the steel cage using crane, pouring the concrete following the underwater concretization method. Excavating soils for the abutment foundation to the designed depth, constructing a pile base, pouring and flatting the concrete base, placing the frame, reinforcing steel, filling soil material to the top layer of the pier foundation. Placing falsework, steel structure for the pile's body and crosshead. Filling soil materials up to the natural ground level and completing the pile. (2) For the piers that have foundation reinforced concrete piles: levelling and identifying the center point of the pier and the pile locations, installing the pile driving machine and driving the piles to the design depth. Excavating soil for pier foot to the designed depth, concretizing the bottom base, flatting the concrete base, placing the falsework, steel bars, pouring concrete, filling soils up to the pier's foot top. Installing falsework and steel structure for the pier's body and the pier crosshead. Pouring the concrete, removing the falsework, filling soils up to the ground level and completing the abutment.

- Underwater abutment: (1) Abutment with foundation on bored piles: installing pile drilling machine on floating system or temporary platform. Bored drilling, stabilizing the borehole with the borehole wall and clay mixture, cleaning of the borehole, placing the steel cage using a crane, pouring the concrete following the underwater concretization method. Installing a cofferdam for piles, pouring concrete to seal the bottom, pumping water out of the foot hole, treating the pipe tips, pouring concrete for a platform to place falsework, steel bars and concrete casting. Installing a falsework, steel bar column, concrete pouring, removing the falsework. Washing out/cleaning riverbed and completing the abutment. (2) Abutment on reinforced concrete piles, identifying the center point of the abutment and the pile locations, installing the equipment on a floating system or a platform, driving the piles to the designed depth. Constructing a coffer dam, excavating soils within the cofferdam, pouring concrete to seal the bottom, pumping water out, treating the pile tips, pouring concrete and flatting out the concrete, placing the falsework, steel bars for the abutment foundation, pouring the concrete. Installing falsework and steel bar columns, pouring concrete, removing the falsework, cleaning the riverbed and completing abutment.

2. Superstructure construction: Preparing a beam fabrication site, mobilizing materials and machineries, constructing falsework, installing steel bars for beams and pre-stressed cable and falsework. Pouring concrete, carrying beams to the construction site, placing them in identified location by cranes or specialized equipment. Constructing the deck slabs and concrete girders. Constructing the waterproof layer for the deck, surfacing the asphalt and completing the bridge construction.

1.7.2 Construction of Tri River Embankment

- *Construction method for the concrete pallets and dredging of the riverbed:*

Construction the embankment in sections:

- Install sheet piles around the riverbank in sections from 100-150m for construction.
- Suck up the water in the construction section and pump out to outside area.
- Dredge the sludge and mud in the riverbed section and excavate organic soil within the embanked area.
- Construct the base and embankment structure.

- After finishing, remove the sheet piles concurrently with placement of stone cages and anchoring the embankment foot.
- The river embankment is constructed in sections until finishing the whole embankment line.

- *Steps of embankment construction:*

- Excavate foundation pite and install the bamboo piles with density of 25 piles/m^2.
- Install stone cages as designed, connect edge-to-edge all cages with each other before putting stones into the cages.
- Construct the embankment foot.
- Construct embankment as designed.
- Construct the graded filter and install drainage pipeline.

1.7.3 Thuy Son Lake

Dredging of Lakebed

- Lake water will be completed sucked up to discharge to the drainage sysem on NH1A. Use bulldozer and excavator to dredge the lake bed to designed depth.
- Excavated soil and dredged materials will be transported by vehicles which are covered to prevent materials from scattering and falling on the way to the approved disposal site.

Construction of Lake Embankment

- *Steps for embankment construction:*

- Use the pump to suck up the foundation pit, ensure foundation pit stabilization and dryness during the embankment construction.
- Excavate the foundation pit and install sheep piles with density of 25 piles/m2.
- Install stone cages as designed, connect edge-to-edge all cages with each other before putting stones into the cages.
- Construct the embankment foot.
- Construct embankment stem structure and sidewalk.
- Construct embankment's crest structure

1.7.4 Wastewater Treatment System

a. Construction of booster pumping station

- Site preparation: Clear the site, positioning the alignment for each designed section, identifying sewer's centreline and mark all designed depths.
- Excavation of foundation pit: Use the excavator to excavate foundation pit along the positioned alignment until nearly achieving designed depth then workers will manually dig up to designed depth and finish the foundation pit.
- Construction of sand layer and lining concrete: Pour the sand to the foundation pit and flatten the sand layer in thickness of 20cm, water the sand and compact. Then, pour the concrete for foundation lining, flatten the concrete and compact.
- Steel reinforcement: Steel reinforcement is installed precisely at designed distance, connect steel bars with each other. Steel length follows the design.
- Installation of falsework: Use the steel moulds and install the mould as designed. Anchor the falsework by steel bars and bolts to ensure stabilization during the concrete casting process.
- Concrete casting: Concrete has to meet designed strength and is checked by slump tester. Free fall height of the concrete mixture is not over 1.5m to avoid segregation. Concrete is poured

evenly and continuously and compacted by compactor. Concrete needs to maintain required moisture during the concretization and removal of scaffolding.

- Soil backfilling: Backfilling the soil in layers around the cuvert body with thickness of 40-50cm, use the bulldozer to flatten and use compactor to compact the soil in layers until designed elevation.

Excavate the soil to 1.5m depth, slope 1:05, and install sheet piles. The construction uses sheet piles grade IV with length of 9m and 12m and shoring system I300, I400, C200.

After completing the pumping station structure, check the permeability of the system. Any detected leakaged will be sealed by epoxy cement and continue the checking process.

b. Wastewater Treatment Plant

➢ **Foundation and Construction Method**

✓ **Foundation Treatment Method for Anxiliary Works**

Site office, guard house, warehouse, chemical house...load on the foundation is small so the foundation is designed on backfilled soil, with the bottom lined by a compacted coarse-granular layer of 0.3m-0.5m depending on each work. Construction is done by excavation with slope 1:0.25. Material used is reinforced concrete B15(M200), the lean concrete is B7.5(M100). Steel structure CI has diameter Φ<10mm, steel structure CII has diameter Φ≥10mm.

✓ **Construction Method for Sterilization Pond**

Use the excavation method. The excavated depth is great so the slope is 1: 0.5. Pond bottom is compacted coarse-granular sand layer with thickness of 0.2m. Material used is reinforced concrete B20(M250), the lean concrete is B7.5(M100). Steel structure CI has diameter Φ<10mm, steel structure CII has diameter Φ≥10mm.

1.8 Expected Machinery, Equipment and Labor

The project expects to mobilize about 140 workers for all work items. Local labors can be mobilized by contractors to do manual work.

Construction machinery and equipment are listed for each project's component as follows"

Table 8: List of Machinery and Equipment for The Project

No.	Machinery	Work items			
		Embankment of Tri river	Embankment of Thuy Son lake	Trunk road connecting urban centers	Wastewater collection and treatment system
1.	Single-bucket excavator, capacity 0.8m^3	2	1	2	2
2.	Bulldozer 108 CV	2	0	2	2
3.	Self-propeller grader 108CV	2	0	2	3
4.	Power shovel 2m^3	2	1	2	3
5.	Vibrating roller 10T	2	0	2	2
6.	Pneumatic roller 16T	2	0	2	2
7.	Watering car 5m^3	2	1	2	2
8.	Crane 130T	2	1	2	2
9.	Mortar mixer	2	1	2	2
10.	Water pump	2	1	2	2
11.	Asphalt paver	2	0	2	2

No.	Machinery	Work items			
		Embankment of Tri river	Embankment of Thuy Son lake	Trunk road connecting urban centers	Wastewater collection and treatment system
12.	Pile driver	2	1	1	2
13.	Generator	2	1	2	2
14.	Haul truck	2	1	2	2
15.	Steel bending machine	2	1	2	2
16.	Welding machine	2	1	2	2
17.	Welding transformer	2	1	2	2
18.	Rammer	2	1	2	2
19.	Concrete breaker	2	1	2	2
20.	Number of workers	30	10	50	50

1.9 Project's Affected Area

The project will be implemented on 5 wards/communes including Song Tri, Ky Hoa, Ky Hung, Ky Trinh and Ky Chau. During its implementation, the project can generate social and environmental impacts on the project areas but also neighboring areas, including:

Table 9: Project Affected Areas

No.	Description	Affected area of the project	Impact
			Air, noise and vibration
1	Main road connecting urban center	Ky Chau, Ky Hung communes, Ky Trinh ward	Population in Ky Chau, Ky Hung communes and Ky Trinh ward in the project area (10 – 500m)
2	Wastewater collection and treatment system	Song Tri ward, Ky Trinh ward, Ky Hoa and Ky Hung communes	Construction phase: - Collection system: population in Song Tri, Ky Trinh wards, Ky Hoa and Ky Hung communes in the project area (10 – 100m). - Wastewater treatment plant: Population in Ky Hung commune in the project area (10 – 500m) Operation phase: Wastewater treatment station: population in the project area (300m – in accordance to TCVN 7222:2002)
3	Embankment of Tri river	Song Tri ward, Ky Hoa commune	Residents in Song Tri ward and Ky Hoa commune in the project area (10-500 m)
4	Thuy Son lake	Song Tri ward	Residents in Song Tri ward in the project area (10-500 m)
5	Road for transportation of material and waste dumping	Song Tri ward, Ky Trinh Ward, Ky Hoa, Ky Hung, Ky Chau communes and neighboring areas	Residents along the road (10 – 200m)

1.10 Project Implementation Schedule

Table 10: Project Implementation Progress

No.	Content	Thời gian
1	Prepare project proposal	9/2016
2	MPI submits to the Prime Minister for approval of the project	2/2017

No.	Content	Thời gian
3	**Prime Ministers approved the Project Proposal**	**3/2017**
4	The proposed investment policy report is prepared and submitted to the Prime Minister (Ministries and central agencies for appraisal)	9/2017
5	**Prime Minister approved Report Proposing investment policy**	**11/2018**
6	Prepare FS and component reports; approve project documents, related reports and project investment decisions	12/2018
7	Project appraisal (Provinces, towns / cities, WB)	1/2019
8	**Approving the Resettlement policy framework**	**2/2019**
9	**Approving Feasibility Study Report (FS) - Provincial People's Committee**	**3/2019**
10	**WB appraisal and approves Feasibility Study Report (FS)**	**01/2019**
11	Issued negotiation package	2/2019
12	Conduct negotiations	3/2019
13	**Signing loan agreement**	**6/2019**
14	**Approving the overall**	**7/2019**
15	Bidding for construction acceptance and handover of works for 30% of investment value	9/2019-3/2021
16	Detailed design, Bidding documents for 30% of the investment value	6/2019-09/2019
17	Approving the detailed design, bidding documents for 30% of the investment value	12/2019
18	Detailed design, bidding documents for 70% of the investment value	01/2020
19	Approving detailed designs, bidding documents for 70% of investment value	12/2020
20	Bidding, construction, acceptance, handover of works to 70% of investment value	01/2020-12/2025

1.11 Budget

Total investment fund of the project is: **1,239,118,546,000 VND** equivalent to **55,072,000 USD** (exchange rate: 1 USD=22,500 VNĐ).

CHAPTER 2. NATURAL, SOCIAL AND ECONOMIC CONDITIONS

2.1 Physical Condition

2.1.1 Geography

Ha Tinh province is located 340km south of Ha Noi. Ky Anh town is located in the southeast of Ha Tinh province, at coordinates of 18°07′35″ N, 106°15′27″E. Ky Anh town borders with Ky Anh district to the northwest and west, with Quang Trach district of Quang Binh province to the South, with the East Sea to the north, northeast and the east.

Ky Anh town has total land area of 28,222 ha and population of 71,399 people. The town has 12 administrative units, including 6 wards namely Song Tri, Ky Trinh, Ky Thinh, Ky Long, Ky Lien, Ky Phuong and 6 communes namely Ky Nam, Ky Ninh, Ky Hoa, Ky Ha, Ky Loi, Ky Hung.

2.1.2. Topography

Ky Anh terrain inclines from southwest to northeast, divided into 3 different topological forms:

- High mountain: Abrupt terrain with Hoanh Son mountain from 700m - 900m high, and series of narrow and fragmented valleys with natural altitude from 65.5m – 235.5m at the mountain foot.
- Midland area: Belongs to basin of Tri river and Quyen river with sloping terrain from Southwest to Northeast, separated by rivers, streams and small watersheds with natural altitude from 12.4m – 47.5m. This area is suitable for construction of small reservoirs and structures.
- The coastal plain: with natural elevation from -0.9 to 8.5m. Areas along estuaries of Cua Khau river, Vinh river and Quyen river are wetland area with elevation from -0.3m to 0.95m. This is the largest cultivated area of the town, surrounded by system of sea dikes and river dikes of Ky Trinh, Ky Long, Ky Phuong, Ky Loi and Ky Thinh communes. This area is at high risk of saline intrusion, frequently lacking fresh water in dry season.
- The coastal dunes: with natural elevation from 2.5 to 10.0m and some high mountains like Do mountain, Cao Vong mountain, Bo Can mountain and Con Tre mountains be varying from 32.5m to 415.7m high and a long sand dune spreading to the southeast with elevation from 3.5m to 20.2m.

2.1.3 Geology

2.1.3.1 Geotechnology

Surveyed results on geotechnical at Vung Ang seaport near the project area show that the area includes three main stratums with main material of fine sand, coarse granular sand and dark grey clay sand. Bearing capacity of the soil R is from less than 1 kg/cm^2 to 3.5 kg/cm^2.

Geological condition at coastal area, wet-land and low-lying area as follows:

- Rich soil layer: thickness of 0.5-1.0m. Sandy soil with bearing capacity < 1.0kg/cm2

- Clay soil and gravel soil mixed with botanical and animal decomposed matters, bearing capacity 1 ÷1.5kg/cm2

- Sandy soil and sand layer: load bearing capacity > 1.5kg/cm2. Pond and lake area: with sludge layer of 0.5 ÷ 1.0m thick and even > 1.5 m. Low load bearing capacity – When constructing the structure, it is required to excavate all the sludge layer then commencing the leveling and backfilling to ensure safety for the structure foundation.

2.1.3.2 Hydrogeology

Groundwater table in coastal are is high, at 0.5m ÷1.0m from ground surface. Groundwater is saline not suitable for domestic use.

2.1.4 Climate

Ky Anh town is located in the southern region of Ha Tinh province where climate regime is highly variable with frequent natural hazards such as flood and storms. This narrow plain area has high rainfall, usually affected by floods and get many difficulties in controlling or minimizing inundation.

Rainfall: Rainfall increases from plain to mountainous area, making the plain area in the region suffering various floods from upstream area. Rainy season starts from July to November annually. Average annual rainfall is 2,513 mm, and the highest annual precipitation is 3,000mm. Average number of rainy days in a year is 165 days. Maximum average rainfall in a day is 519.1mm.

Storm: On average, each year there is 1-7 hurricanes hitting the coast, storms cause torrential rains, especially in the upstream of the river causing floods in the eastern coastal and river plains. The maximum wind speed during storm is V = 48m/s (Once in 50 years). The storms cause many damages and loss for people and property, washing away crops, houses, especially the storm in the year 2007 which caused flood and loss for many properties and houses in the region. On 12 – 15/9/2017, the storm No. 10 crashed to Ky Anhtown with 11-level wind causing loss up to 1.197,03 billion dongs and 9 injured people.

Wind: There are two wind regimes in the region typically for the two seasons. In the summer, the southwesterly and southeasterly wind dominates, and dry and hot "Laos" wind blows in May (Southwesterly wind) causing high evaporation, lead to drought and shortage of freshwater for domestic use, agricultural and fishery production. In the Winter, the northeasterly wind dominates. Average wind speed is 2.3m/s, maximum wind speed is 48m/s.

Temperature: Average temperature 23.8^{o}C. The hottest month is June with average temperature at 32.9^{o}C.

Moisture: Annual average moisture 86%.

Sunshine: Total sunny hours in a year 1,536 hours.

Evaporation: On average per year 1,034 mm

2.1.5 Hydrology

Hydrology:

Ky Anh town is affected by the hydrological regime of Tri river and Quyen river. Maximum tidal level at the estuary of Quyen river on average is 1.77m, frequency 10 %= 2.22m, frequency 5 %= 2,416m.

- The Tri river is derived from the mountain in the west of Ky Hoa commune, in the Northwest of Ky Anh commune and flows from the Northwest - Southeast into the Quyen river at Hai Nam estuary, with length of 26km, the basin area of 57km^2. According to the data of the Irrigation division - Department of Agriculture and Rural development, the storm No.5 in the year 2007 flooded National Highway 1A in the northern region of Tri river's bridge from 0.3m ÷0,6m, the first time in 30 years.

- The Quyen river is Derived from the hills at 300m elevation in Dinh village, flowing from southwest to northeast, entering the sea at Vung Ang. Catchment area F = 216Km2, river length L = 34km, basin slope i = 13.1 %. Density of 1.26 km/km^2, meandering coefficient of 3.16. The river's major tributaries are canals of Lau, Tau Voi, Thau Dau, Luy and Nuoc Man.

- The Bau Cau river is one small tributary of Quyen river, with total length of 4.26km on Ky Hung commune and Ky Trinh ward.

- There are 5 big lakes in Ky Anh town namely Kim Son, Tau Voi, Dat Cat, Moc Huong and Thuong Tri lake (the lake upstream of Tri river) and a system of up to 20 small ponds and watersheds. Thuy Son lake belongs to the system of small watersheds under management of Ky Anh town People's Committee, with total area of 1.9ha

According to statistics data, surge water levels in the storm in Ky Anh town at Quyen river and Tri river in year 1987 = 2.28m, in 1989 = 2.68m. Current elevation of the dikes of Tri River and Quyen river is 3.6 m÷ 4.2 m and is being upgraded to ≥ +4.0 m

Marine Hydrology

Tidal regime in the area of Vung Ang, Mui Ron are mainly of irregular diurnal tide[7]. The highest water level for many years in Vung Ang (Nautical chart system) is 2.85m[8].

2.1.6 Existing Environmental Quality

The project owner and consultant team have collaborated with the Architecture and Energy Micro-Climatic Environment Research Center - Institute of Tropical Architecture - Hanoi Architectural University to carry out survey, measurements and take environmental samples in compliance with TCVN (Vietnam National standards) during May 2017. Samples were analyzed in laboratories. The map showing the sampling locations is provided in Annex 3.

2.1.6.1. Air Quality

Analysis of 11 air samples taken on May 5, 2017 from the project area are presented in Table 11 below.

Table 11: Ambient Air Quality

Sample symbol	Work	Sampling location	Measured and analyzed parameter					
			Dust	NO_2	SO_2	CO	Noise	Vibration
			µg/m^3	µg/m^3	µg/m^3	µg/m^3	dBA	dB
MK1	Thuy Son lake	Thuy Son lake near NH 1A	196	58.2	56	1500	73.6	60.4
MK2	Embankment on Tri river	Tri bridge	185	55.4	62	1400	72.5	60.8
MK3		Residential area, left bank of Tri river	96.3	38.5	32	863	62.1	48.2
MK4		Residential area, right bank of Tri river	95.2	37.6	31	772	61.4	48.1
MK5	Wastewater treatment system	At the start wind direction in the WWTP construction area	62.4	24.3	12.4	551	50.3	20.3
MK6		At the end wind direction in the WWTP	63.1	24.2	13.1	558	51.1	20.6

[7] Feasibility study report for construction of Vung Ang port, TEDI, November 1997,
[8] Report for investment project of construction of dock 2 for Vung Ang port – phase II, TEDI, 2003 (page 7),

Sample symbol	Work	Sampling location	Measured and analyzed parameter					
			Dust	**NO_2**	**SO_2**	**CO**	**Noise**	**Vibration**
			µg/m^3	µg/m^3	µg/m^3	µg/m^3	dBA	dB
		construction area						
MK11		Residential area in Tan Tien hamlet, Ky Hung commune	121	38.9	42.7	845	56.2	55.6
MK7	Main road	Junction with Nguyen Thi Bich Chau road	103	31.2	38	852	58.4	32.6
MK8		Culture house in Hieu Chau hamlet	116	33.5	41	801	60.3	35.1
MK9		Ky Chau kindergarten	98	32.6	40.5	834	55.4	45.8
MK10		Residential area at the end of the route	106	34.8	41.7	821	57.3	53.2
Analyzing method			TCVN 5067-1995	TCVN 6137-2009	TCVN 5971-1995	TQKT-VSMT 2002	TCVN 7878-2:2010	TCVN 6963 : 2001
QCVN 05:2013/BTNMT (average in 1 hour)			**300**	**200**	**350**	**30.000**		
QCVN 26:2010/BTNMT							**70**	
QCVN 27:2010/BTNMT								**75**

Note:

- QCVN 05: 2013/BTNMT: National technical regulation on ambient air quality
- QCVN 26: 2010/BTNMT: National Technical Regulation on noise
- QCVN 27: 2010/BTNMT: Technical regulation on vibration

(*): Parameter recognized by Vilas. Weather condition at the time of sampling: moderate sunshine and wind, air temperature 29-32^{o}C.

The data in the above table showed that the air quality at the surveyed areas was within the allowable limits. However, there are still some unique features that make a difference in the measured values at locations, especially the dust parameter:

- At points like MK1, MK2: having the highest dust concentration due to the high traffic density near the highway. However, for these locations, dust concentrations are still within acceptable limits.
- At the remaining points: dust concentration varied from 95-121 µg/m3 due to low traffic volume. The lowest dust concentration was at points MK5 and MK6 due to low traffic density and far from residential area.

From these results, it is able to preliminarily conclude that the air environment in the project area has not been polluted.

2.1.6.2 Surface Water Quality

Water quality samples were taken from 12 locations listed in Table 12 below. The results of surfacewater quality analysis are shown in Table 13.

Table 12: Surface Water Sampling Locations

Sample	Location	Sample	Location
NM1	At the influent of source to Thuy Son lake	NM7	At the construction area of wastewater treatment plant
NM2	Near residential area of Thuy Son lake	NM8	Tri river water, distanced 500m from the tentative construction area of the wastewater treatment plant toward the upstream
NM3	At middle of Thuy Son lake	NM9	Tri river water, distanced 500m from the tentative construction area of the wastewater treatment plant toward the downstream
NM4	Tri river weir	NM10	Near Nguyen Thi Bich Chau street
NM5	Near Tri river bridge	NM11	At the tentative junction of the main road and Tri river (Ky Chau commune)
NM6	At the middle of Tri river embankment section	NM12	At the tentative junction of the main road and Cau Bau river

Comparing the analyzed results of 12 surface water samples with allowable levels in QCVN 08: 2015/BTNMT (Vietnam National Regulation on Surface water quality), it is shown that:

Comparing with allowable limits applicable for domestic water supply with appropriate treatment (column A2), water quality at most sampling locations have COD and BOD5 concentrations higher than allowable limit, in which COD concentration is 1.4 to 3.8 times higher than allowable limit and BOD5 concentration is higher than the allowable limit from 1.5 to 7.8 times. The highest COD and BOD5 concentration is found in water sample taken at the intersection between the proposed road connecting urban centers and the Cau Bau River (NM12) because this river branch receives most of wastewater discharged from Ky Anh Market and the town hospital. Beside Cau Bau River, Thuy Son Lake is also receiving waste water of some households around, so the water quality is badly affected.

Comparing with allowable limits set for irrigation and inland waterway transport, COD, BOD_5 concentrations and surfactants in water samples taken are higher.

Comparing the water quality of the Tri River with allowable limit in column B1, most of the parameters are lower than the standard, but some water from some sampling locations (NM7, NM8, NM9, NM10) still have high BOD_5 concentration because these locations are close to households' influent sources into the river.

Thus, the surface water quality in the project area is contaminated with organic matters due to the fact that the rivers and lakes in the project area receive waste and domestic effluents from surrounding households. Moreover, there is no wastewater collection and treatment system so the quality of water is increasingly reduced.

Table 13: Quality of Surface Water Samples Taken in The Project Area

Sample	pH	TSS	DO	COD	BOD_5	Ammonia (NH_4^+)	Nitrite	Nitrate (NO_3^-)	Phosphate (PO_4^{3-})	Clorua (Cl^-)	Fe	Surfrant	E. coli	Coliform
	-	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	MPN/100ml	MPN/100ml
NM1	6.88	**60.1**	5.03	**64**	**35.3**	**0.92**	0.008	3.26	1.17	213	0.66	0.54	15	$9.3x10^3$
NM2	6.92	**66.3**	5.38	**53.8**	**32.6**	0.87	0.006	3.16	1.14	228	0.61	0.52	23	$9.1x10^3$
NM3	7.01	**50.4**	4.21	**50.5**	**29.5**	0.83	0.006	3.05	1.06	189	0.65	0.51	11	$9.1x10^3$
NM4	7.02	45.2	4.02	12	8.7	0.082	0.001	0.62	0.19	23.62	0.52	0.04	9	1263
NM5	6.63	**62.5**	6.2	15.4	10.6	0.33	0.001	0.74	0.26	24.3	0.53	0.05	26	1406
NM6	6.86	45.1	4.58	14.7	10.2	0.32	0.001	0.68	0.23	23.47	0.51	0.041	18	1387
NM7	6.89	38.6	4.07	24.7	**15.3**	0.45	0.002	1.16	0.46	23.52	0.48	0.03	13	1305
NM8	7.05	40.3	5.23	28	**15.56**	0.56	0.001	1.21	0.52	23.64	0.53	0.038	21	1832
NM9	6.98	**72.1**	5.8	28	**16.2**	0.58	0.002	1.27	0.58	23.97	0.54	0.03	31	1521
NM10	7.02	**56.3**	4.86	28.5	**17.3**	0.61	0.002	1.14	0.46	24.1	0.47	0.32	28	3486
NM11	6.85	**60.2**	6.24	25.6	**15.8**	0.58	0.001	0.94	0.44	24.32	0.48	0.026	29	1435
NM12	7.01	**61.1**	7.53	**86.5**	**47.2**	**1.32**	0.004	1.82	0.72	185	0.52	0.47	32	$1.2x10^3$
Testing method	TCVN 6492:2011	TCVN 7325:2004	TCVN 6492:2011	SMEWW 2540D-2012	SMEWW 5220C-2012	SMEWW 4500 P. D - 2012	SMEWW 4500.NH3.C:2012	SMEWW 4500.NO2.B:2012	SMEWW 5210B-2012	TCVN 6180:1996	SMEWW 4500.Cl.B:2012	SMEWW 3500.Fe.B:2012	TCVN 6187-2:1996	SMEWW 5520C:2012
QCVN 08: 2015/BTNMT														
A2	**6-8,5**	**30**	**≥ 5**	**15**	**6**	**0,3**	**0,05**	**5**	**0,2**	**350**	**1**	**0,2**	**50**	**5000**
B1	**5,5-9**	**50**	**≥ 4**	**30**	**15**	**0,9**	**0,05**	**10**	**0,3**	**350**	**1,5**	**0,4**	**100**	**7500**
B2	**5,5-9**	**100**	**≥ 2**	**50**	**25**	**0,9**	**0,05**	**15**	**0,5**	**-**	**2**	**0,5**	**200**	**10000**

Column A2: Quality norm for surface water for domestic use after appropriate treatment.
Column B1: Quality norm for surface water for irrigation purpose
Column B2: Quality norm for surface water used for inland water purpose

2.1.6.3. Wastewater Quality

Analyzing results on quality of domestic wastewater sampled at 6 locations in Ky Anh town presented in Table 14 show that TSS, BOD_5 and Coliform lightly exceed allowable limit at some locations.

Table 14: Sampled Wastewater Quality

No	Parameters	Unit	Results						QCVN 14: 2008/ BTNMT (column B)
			NT1	NT2	NT3	NT4	NT5	NT 6	
1	pH	-	7.13	7.06	6.98	7.05	7.08	6.92	**5- 9**
2	TSS	mg/l	**121.4**	99.2	84.7	98.2	88.7	99.2	**100**
3	COD	mg/l	93.6	82.3	71.4	83.3	75.1	91.6	**-**
4	BOD_5 (20^0C)	mg/l	**59.4**	**55.7**	40.6	46.1	45	48.2	**50**
5	Amonium	mg/l	6.13	4.21	2.26	4.14	3.38	4.84	**10**
6	Sulfide (by H_2S)	mg/l	0.76	0.54	0.22	0.48	0.36	0.52	**4**
7	Nitrate	mg/l	22.5	21.4	17.3	21.37	19.3	22.06	**50**
8	Phosphate	mg/l	2.39	2.1	1.25	1.92	1.73	2.07	**10**
9	Total surfactants	mg/l	3.14	3.06	2.56	2.94	2.73	3	**10**
10	Oil, grease	mg/l	6.75	5.12	3.38	5.4	4.1	5.3	**20**
11	Coliform	MPN/100ml	74000	65000	44000	6520	6340	7280	**5,000**

Sampling location
NT 1: Residential area on Le Quang Chi street
NT 2: Residential area on NH1A opposite to Thuy Son lake
NT 3: Residential area on the left bank of Tri river
NT4: Residential area of Tan Tien hamlet, Ky Hung commune
NT5: Residential area in center of Ky Trinh ward
NT6: Residential area in center of Ky Hoa ward

2.1.6.4. Groundwater Quality

Analyzin results of groundwater samples in the project area show that, all parameters, including heavy metal content are within allowable limit in QCVN 09: 2015/BTNMT for ground water quality.

Table 15: Analysing Results of Groundwater Sample Quality

No	Parameter	Unit	Result				QCVN 09:2015/ BTNMT
			NN1	NN2	NN3	NN4	
1	pH	-	6.89	7.06	7.15	6.98	**5.5 - 8.5**
2	Hardness (by $CaCO_3$)	mg/l	56.5	57.3	53.8	54	**500**
3	Ammonium (NH_4^+) (by N)	mg/l	0.052	0.043	0.052	0.045	**1**
4	Nitrite (NO_2^-) (by N)	mg/l	0.042	0.034	0.026	0.032	**1**
5	Nitrate (NO_3^-) (by N)	mg/l	1.16	1.02	1.57	1.63	**15**
6	Chloride (Cl^-)	mg/l	5.3	5.38	6.2	7.5	**250**

No	Parameter	Unit	Result				QCVN 09:2015/ BTNMT
			NN1	NN2	NN3	NN4	
7	Fluoride	mg/l	0.04	0.02	0.03	0.05	**1**
8	Sulfate	mg/l	55.6	50.3	50.2	52.3	**400**
9	TDS	mg/l	136.5	138.7	130.8	138.4	**1500**
10	(Fe)	mg/l	1.32	1.51	1.58	1.52	**5**
11	Arsenic (As)	mg/l	0.003	0.006	0.008	0.004	**0.05**
12	E. coli	MPN/100ml	KPH	KPH	KPH	KPH	**KPHT**
13	Coliform	MPN/100ml	1	1	1	2	**3**
Groundwater sampling locations NN 1: Residential area near Thuy Son lake (Mrs. Le Ti's house) NN 2: Residential area on right bank of Tri river (Mrs Nguyen Thi Lam's house) NN 3: Residential area on left bank of Tri river (Mr. Dang Van Toi's house) NN4: Residential area in Hieu Chau hamlet (Mrs Le Thi Viet's house)							

2.1.6.5. Soil Quality

Analyzing results on 4 soil samples taken from the project area show that the contents of Pb, Zn, As, Cd, Zn of all samples are within allowable limit in the QCVN 03-MT: 2015/BTNMT for agricultural and residential land.

Table 16: Analysis Results of Soil Quality

Sample symbol	Work item	Sampling location	Parameter				
			(Cu)	(Pb)	(Zn)	(Cd)	(As)
			mg/kg dry soil	mg/kg dry soil	mg/kg dry soil	mg/kg dry soil	mg/kg dry soil
Đ1	Embankment on Tri river	Weir of Tri river	2,62	4,83	58	0,14	2,73
Đ2	WWTP	The area for construction of WWTP in Ky Hung commune	2,6	4,65	56	0,13	2,51
Đ3	Main road connecting urban centers	Agricultural land at the beginning of the route	2.3	4.52	52.5	0.128	2.47
Đ4		The intersection with district road 12a.	2.47	4.47	51.2	0.15	2.43
QCVN 03-MT:2015/ BTNMT	**Production land**		**300**	**300**	**300**	**10**	**25**
	Agricultural land		**100**	**70**	**200**	**1.5**	**15**
	Residential land		**100**	**70**	**200**	**2**	**15**

2.1.6.6. Sediment Quality

Dredging work will be implemented at Thuy Son Lake, Tri River, cross-river bridge construction area on the central urban road and at the construction site of the wastewater treatment plant. The excavated and dredged materials will be transported to the dumping sites. Therefore, to assess the impact of this material on the environment, it is very necessary to analyze and assess sediment quality. In the report,

8 samples of sediment were taken from the project area and analyzed with the results shown in Table 17.

Table 17: Analysis Results on Sediment Quality

Symbol	Parameters							
	(Cu)	(Pb)	(Zn)	(Cd)	(As)	Hydrocarbon	Cl-based pesticide	P-based pesticide
	mg/kg dry soil							
TT1	11.6	8.68	93	0.69	3.32	2.1	$<0.045 \times 10^{-3}$	$<0.15 \times 10^{-3}$
TT2	11.4	8.63	98	0.59	3.21	1.8	$<0.045 \times 10^{-3}$	$<0.15 \times 10^{-3}$
TT3	10.8	7.62	83	0.47	3.64	<0.2	$<0.01 \times 10^{-3}$	$<0.01 \times 10^{-3}$
TT4	6.2	8.3	92	0.25	3.08	<0.2	$<0.01 \times 10^{-3}$	$<0.01 \times 10^{-3}$
TT5	7.2	7.81	96	0.25	3.01	<0.4	$<0.01 \times 10^{-3}$	$<0.01 \times 10^{-3}$
TT6	7.6	7.75	92	0.26	3.16	1.6	$<0.03 \times 10^{-3}$	$<0.15 \times 10^{-3}$
TT7	6.1	8.83	87	0.28	3.34	<0.6	$<0.01 \times 10^{-3}$	$<0.01 \times 10^{-3}$
TT8	6.3	8.7	104	0.43	3.02	<0.6	$<0.01 \times 10^{-3}$	$<0.01 \times 10^{-3}$
QCVN 43: 2012/ BTNMT (fresh water)	**197**	**91.3**	**315**	**1.5**	**17**	**100**	**-**	**-**
QCVN 07:2009/ BTNMT Ctc (mg/l)	**-**	**15**	**250**	**5**	**2**	**-**		
QCVN 03/2015 agricultural land	**100**	**70**	**200**	**1.5**	**15**			

Sampling location

TT1: Thuy Son lake – near the residential area
TT2: Middle of Thuy Son lake
TT3: Weir of the Tri river
TT4: Near Tri river bridge
TT5: At the tentative junction of the main road and Tri river
TT6: At the tentative junction of the main road and Cau Bau river
TT7: At the construction area of WWTP
TT8: Tri river water, distanced 500m from the tentative construction area of the wastewater treatment plant toward the downstream

Analyzing results on sediment samples taken from the project area compared with QCVN 43:2012/BTNMT, QCVN 03-MT:2015/BTNMT and QCVN 07:2009/BTNMT[9] show that, all parameters in the samples are within allowable limit. This mean that the sediment samples are not polluted by heavy metal.

2.1.7 Biological Resources

Ky Anh twn is located in the region which has been modified by human activities for a long time and is on the way of fast urbanization. Thus, local vegetation and ecosystem in the project area have been under influence of people's living and production activities. At present, the majority of local ecosystem is agricultural or secondary ecosystem. The Ke Go lake Natural Reserve in Ky Anh town is located at 12.6km from the Project area.

Survey on the existing status of the project area showed that:

- Terrestrial ecosystems: There are no rare or endangered species in the project area. At present, this area is residential land and agricultural land with majority of fruit trees (mango, jack fruit, guava ...), crops (peanut, sweet potato, watermelon ...), timber trees, bushes and weeds. There

[9] QCVN 43:2012/BTNMT – National regulation on fresh water sediment; QCVN 03-MT:2015/BTNMT – National regulation on limit of some heavy metals in agricultural land; QCVN 07:2009/BTNMT: Hazardous waste threshold

are also animals like frogs, reptiles, and insects, birds ... living along the banks of the river and lake.

- Aquatic species: Survey results showed that aquatic species in the project area mainly concentrates in the downstream of Quyen, Tri rivers including carp, snake-head fish…and some other crustaceans such as shrimps, snails, and some mollusks. In addition, some aquatic plants are also found in these area like water spinach, water hyacinth. There is no known rare or endangered species in the project area.

- There are some fishing activities on Tri river in the project area but these activities are not regular and not the main income source for people. Popular fishes catched in this area are: small fish and carpio…

Some aquatic samples have been taken and analyzed. Sampling positions are presented in Table 18.

Table 18: Analysis Results on Aquatic System Quality

No	Group	Diameter	Unit	Result											
				TS1			TS2			TS3			TS4		
				Surface layer	*Middle layer*	*Bottom layer*	*Surface layer*	*Middle layer*	*Bottom layer*	*Surface layer*	*Middle layer*	*Bottom layer*	*Surface layer*	*Middle layer*	*Bottom layer*
1	Ultra-nanoplankton	<2µm	pc	KPH	KPH	KPH	KPH	KPH	KPH	KPH	KPH	KPH	KPH	KPH	KPH
2	Nanoplankton	2-20 µm	pc	16	29	30	12	26	22	15	27	32	14	24	21
3	Microplankton	20-200 µm	pc	13	21	26	10	18	17	12	20	24	11	16	15
4	Mesoplankton	200 µm-2mm	pc	5	6	7	6	4	4	6	5	4	5	3	3
5	Macroplankton	2-20mm	pc	6	10	11	5	8	7	5	9	10	6	5	6
6	Mega-zooplankton	>20mm	pc	3	2	4	1	2	3	4	3	3	2	3	5
7	Micronekton	20-200mm	pc	20	30	40	16	27	30	19	29	39	15	28	31

2.2 Socio-economic Condition

2.2.1 Population, Ethnicity

Ky Anh town has total land area of 2,822 km^2, and population of 71,399 people (20,396 households) by the year 2015. All the town residents are Kinh people, with 41,492 people living in urban areas (equivalent to 58.11%) and 29,907 people living in rural areas (41.89%). Male population accounts for 50.46% (36,029 people) while female population accounts for 49.54% (35,370 people). The population in each ward/commune is show in Table 19 below.

Table 19: Population in Project Wards/Communes

No	Administrative unit	Area (km^2)	Population (people)	Density (people/ Km^2)
Ky Anh town			**71,899**	**25.5**
1	Song Tri ward	51.829	10,986	212
2	Ky Trinh ward	479.502	5,878	12.3
3	Ky Hoa commune	319.808	4,659	14.6
4	Ky Hung commune	147.826	1,543	10.4

(Source: Statistical yearbook of Ky Anh town in 2016)

2.2.2. Land Use Status

Majority of land in Ky Anh town is agricultural land (58.94%) and forest (51.21%), aquacultural land (4.28%) and land for other use purposes (0.71%). Land use map is shown in Figure 16 and types of land use in each ward/commune is presented in Table 20.

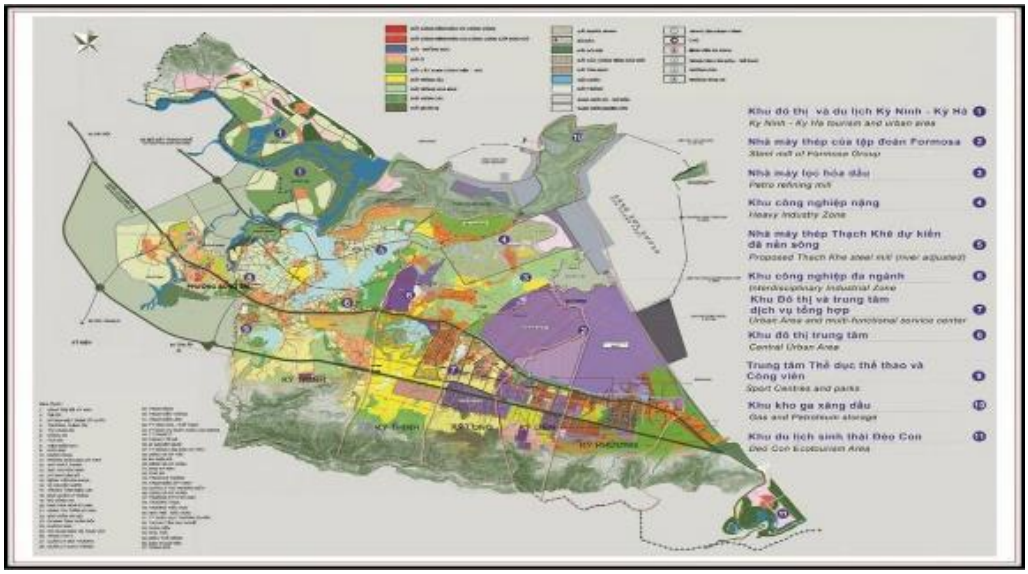


Figure 16: Ky Anh Town's Land Use Map

Table 20: Ky Anh town's Land Use in Wards/Communes

Ward/ Commune	Land area	Land Area (ha)				
		Agricultural land	Forest plantation	Aquaculture	Non-agriculture	Unused
Total	**28,221**	**7,275**	**8,515**	**712**	**8,862**	**2,857**
Song Tri	518	205	14	1.5	276	21
Ky Ninh	2,150	660	638	123	484	244
Ky Loi	2,077	389	972	2	570	145
Ky Ha	1,006	115	178	71	397	245
Ky Hung	1,478	272	530	42	255	380
Ky Trinh	4,795	1,619	1,417	320	944	495
Ky Thinh	4,033	1,965	594	8	1,152	314
Ky Hoa	3,198	638	1541	4.6	859	156
Ky Phuong	3,741	397	929	40	1,900	473
Kỳ Long	2,131	426	444		1,163	98
Ky Lien	1,286	307	369		605	4.5
Ky Nam	1,808	282	890	100	256	281

(Source: Statistical yearbook of Ky Anh town in 2016)

Determination of validity of land use right certificate on the 5 project wards/communes shows that, at the time of preliminary inventory of losses, all affected households have had land use right certificates.

2.2.3 Economic Mechanism and Growth Rate

Ky Anh town's annual economic growth rate is rather high, always over 20%/year and GDP per capita is higher than the province's average rate.

Table 21: Economic Growth Rate and GDP per capita

Year	Growth rate (%)	GDP/per capita of the town/year (million)[10]	GDP/per capita of the province/year[11]
2015	24.17	45	38,9
2014	22.2	35	34

Source: Socio-economic report of the town and province by year

Economic structure changes toward decrease in agriculture and increase in industry and service. Data in 2014, 2015 and 2016 is presented in detail as follows:

Table 22: Percentage of Economic Sector of The Town

Year	Agriculture – Forestry – Fishery	Industry – Small industry and handicraft – Construction	Trading - Service
2015	3.33	67.14	29.53
2014	5.96	64.2	29.85

Source: Socio-economic report of the town and province by year

2.2.4. Labor and Employment

According to statistical data in 2016, labor and employment of Ky Anh town as follows: Labor in working age is 38,361 accounting for 53.7% the town's total population, in which 30,146 people working in economic activities, accounting for 78.6% total labor in working age, and 8,215 people are pupils, students and disabled people not joining in economic activities. Employed labor accounts for high percentage, about 30,079 people, working in following sectors:

- Agriculture, forestry and fishery: 10,419 people;
- Industry and construction: 8,437 people;
- Trading and service sector: 11,233 people.

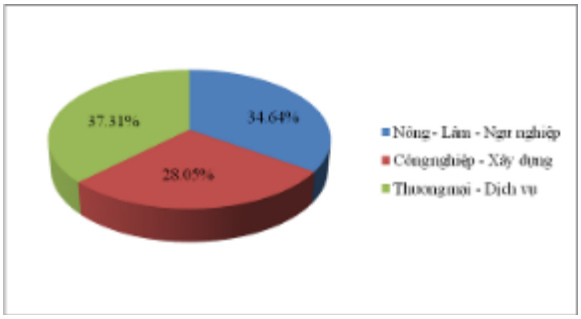


Figure 17: Labor Structure in Economic Sectors in 2016

(Source: Ky Anh town People's Committee, 2016)

10 Current price
11 Current price

❖ **Occupational Structure of Local People in The Project Area**

The surveyed heads of household participate in 4 main sources of incomes: agricultural sector (82.0%), retirement allowances (6.0%), government employees (4.0%), trade/service (3.3%).

Most of household members earn their living by working in agriculture – forestry – fishery (this group accounts for 51.5% of total surveyed member). A small percentage is retired people and government employees with stable monthly income (accounting for 10.4%). Number of households running businesses/opening shops (mainly at the market or at home) accounts for 1.2%. Students and pupils account for a relatively high percentage of 24.2%. This result shows that, on average, percentage of dependent people in households is rather high with over 30% including people with no income (including housewives), the elderly (no pension), small children and pupil/students...

2.2.5. Income

Ky Anh town people mostly depends on agriculture. Nearly 60% households have main income source from agricultural production. In addition, 16.7% households have income source from salary. Average income of affected households in the survey is about 8.1 million dongs/month. However, popular income is 5 million dongs/month and the highest income is 43 million dongs/household/month while the lowest income is 1 million dong/household/month.

According to surveyed results in the project area, the highest income of households in the project area is 43,000,000 VND/HH/month while the lowest income is 1,000,000 VND/HH/month. The monthly average income of households in the project area is presented in following table:

Table 23: Household's Monthly Average Income

≤ 3 mil VND		**Fom 3 – 5 mil VND**		**From 5 – 9 mil VND**		**≥ 9 mil VND**		**No answer**		**Total**	
HH	%	HH	%	HH	%	HH	%	HH	%	HH	%
14	9.3	18	12	22	14.7	19	12.7	77	51.3	150	100

2.2.6. Education

There are 35 schools from kindergarten to high school in the town, of which 25 schools meet national standards, serving nearly 20,000 pupils, including 5,487 kindergarten pupils, 6,630 primary school students, 4,678 secondary school pupils and 2,916 high school students. The universalization of preschool education for 5-year-olds and secondary school is maintained.

Generally, education level of directly affected people is not very high. Percentage of affected household member being illiterate/not going to school is 10.2%, most of them are the elderly and pre-school children. 10.6% household members have primary school degree level, most of family members have secondary school degree (44,2%) and high school degree (24.9%); college/university (9.3%) and post graduate degree (0.7%).

2.2.7. Medical Service and Healthcare

There are 13 health care facilities in the area including 1 hospital and 12 medical clinics. The health sector has made great efforts in preventing outbreak of disease and controlling food hygiene. National health programs and targets are fully implemented, such as

STD diseases prevention program, reproductive health-nutrition program; HIV/AIDS prevention and control; prevention of malaria; occupational hygiene and other programs are effectively implemented at the Commune Health Centers. According to MOH, by 20/5/2017, Ky Anh town found 51 cases of HIV/AIDS (of which 43 cases at AIDS phase) and 17 peopled died of AIDS.

2.2.8. Physical Cultural Resources

Ky Anh town has two nationally-recognized monuments and six provincially-recognized relics:

Le Quang Chi - Le Quang Y Temple: is located in Ky Phuong ward, Ky Anh Town, Ha Tinh Province. The temple was built for worshipping two valedictorian brothers Le Quang Chi and Le Quang Y (also known as Holy Temple). The temple was ranked historic-cultural vestige in 1996.

Temple of Holy Mother Nguyen Thi Bich Chau: is located in Ky Ninh Ward, Ky Anh Town, Ha Tinh Province which was built for worshipping imperial concubine of Kinh Tran Hue Tong. The temple was ranked as historic-cultural vestige in 1991.

Provincial-level historic-cultural vestiges: Hoanh Son famous landscape (Ky Nam commune), Lieu Hanh Princess Temple (Ky Nam commune), Pham Tiem Ancestral worshipping house (Song Tri ward), Nguyen Van Khoa Ancestral worshipping house (Song Tri Ward), Eo Bach Temple (Ky Loi Commune), local temple (Ky Ninh Commune).

In addition, there are some objects that may be spiritually important to local communities in the Project area such as ancient water wells. Family worshipping houses are also popular in the Project area.

2.2.9 Gender Issue

Surveyed result on gender issue in Ky Anh town show that:

- Education: The surveyed results show that, there is no educational restrict for female in the project area. At present, all children at school age can go to school regardless their gender, household's economic condition and religion.
- Property's ownership: According to the Land law 2013, husband and wife should share the name in their land use right certificate. However, the surveyed results show that, 31.5% of surveyed people said their land use right certificates bear only husband's name while the percentage for wife holding name in the land use right certificate is 15.3%.
- Labor division:
    - 71.2% surveyed people said that women take main responsibility for housework and taking care of children and the elderly in the family.
    - For making living/earning income, in the project area, women usually do farming work and are also suitable for doing business, small shops (grocery shops, street vendors, hair cut…) with percentage of 69.7%. Men mainly work as hired labor (construction, porter or labor export ...). Women contribute about 30% of total household income. These analysis shows that employment opportunities and adaptability to career change are an obstacle for local women. In case of resettlement and relocation, women are more affected than men, especially middle-aged single women (6 households).
- Participation in public meeting:
    - Survey on participation in community activities and participation in local organizations shows that there is not much difference in gender. 69.4% of respondents said that both women and men participate in community and local meetings.
- Making decision for family issues:
    - For family decisions, the results show that in most of surveyed households, both men and women participate in discussing and making decisions. For purchasing family's assets and decision for spouse's education, the percentages are 46% and 69.3%, respectively. For decisions in changing careers, borrowing money to do business and holding name in property ownership, men often play the main role and main decision-maker in the family

2.3 Infrastructure Condition

2.3.1. Transport System

Roadway: There are national highways running through Ky Anh town including NH1A, NH1A bypass and NH12C. For NH1A: grade III road quality, road base is 12m wide, asphalt concrete pavement with 11m wide, in good quality. 1A Highway by-pass: in the West of Highway 1A, with grade III road quality, road base is 12m, asphalt concrete pavement with 11m wide, in good quality. 12C Highway: from Ky Anh town to Ho Chi Minh highway toward Chalo border gate.

The road connected between 1A Highway and Vung Ang seaport has been expanded with grade III road quality, base width is 12m, concrete pavement with 11m wide with good quality. This road connecting to Vung Ang 1 thermal power plant has a base width of 12m and pavement width of 7m. The main road system in the economic zone has been developed and will have the width of 9-16m.

The road system in resettlement areas has been built with good quality (resettlement area in communes of Ky Thinh, Ky Long, Ky Lien, Ky Phuong and Ky Loi). There is also a system of collector roads, branch roads and alleys in residential areas in wards and communes. These roads have been built for a long time with high traffic density and rather small scope (B ≤7.5m) and lack of technical infrastructure.

The routes serving the project namely NH1A, Nguyen Thi Bich Chau, Le Quang Chi and NH12C are mainly national highways and provincial roads so they were constructed with rather good quality.

Ky Anh town has 1 coach-station and 2 car-parking places.

Table 24: List of Roadway Headworks

No	Work	Location	Area (ha)	Distance to construction site
I	**Coach station**		**0.15**	
1	Ky Anh coach station	KP1 – Ky Anh town – Ky Anh district	0.15	0.7 – 4 km
II	**Car parking places**		**0.35**	
1	Bich Chau temple car parking place	Ky Ninh commune- Ky Anh town	0.15	2 – 6 km
2	Ky Long car parking place	Long Hai hamlet – Ky Long commune (opposite to Le Quang Chi school)	0.20	2 – 6 km

Waterway: Ky Anh town has two important cargo seaports namely Vung Ang port and Son Duong port. Son Duong port - Vung Ang is a national general port and is the local transportation hub of Vietnam (type I port), only 9 km from National Highway 1A, 230 km from Vietnam - Laos border (Mu Gia Pass).

The Vung Ang port has two major wharves that have been put into operation (depths from -11m to -13m), namely Vung Ang general port and coal transportation port for Vung Ang thermal power plant.

Son Duong port is being built by Formosa into a modern specialized port with the size of 32 berths (including 2 stages), the total length of berths is over 8.6 km; The depth is from -23m to -25m. After completion, the port is capable of receiving ships up to 300 thousand DWT.

There is almost no waterway transport activities in the Tri river and Quyen river where bridges will be built under the Project.

2.3.2. Water Supply

At present, in Ky Anh Town there are two water supply systems: industrial water supply system and domestic water supply system.

Industrial water supply system: There are two water plants supplying water for production and industrial purposes namely Hoanh Son water plant and water supply plant in Formosa industrial zone.

At present, Hoanh Son water plant has capacity of 380,000 m3/day supplying water for Vung Ang I thermal power plant and it is located in Tay Yen district. Raw water is taken from Rao Tro lake and Tri upstream lake. The location of Hoanh Son water plant is 8km upstream from the waste water treatment plant. The plant has completed the first phase, capacity Q = 40,000 m3/day.
In addition, FORMOSA has built its own water supply system, with a pipeline of DN = 2,000mm of raw water, and a source of water from the Tri river upstream lake. The water source is untreated and only serves the purpose of production, not used for living purposes

Domestic water supply system: Ky Anh town is using the water supply network of Vung Ang 1 clean water plant. The raw water source for the plant is taken from the upstream lake of Tri river. The water supply is concentrated in the wards of Song Tri the center of Ky Anh town with population of over 12,000 people and the communes of Ky Long, Ky Lien, Ky Trinh, Ky Phuong, Ky Thinh with 35,000 people and some areas along National Highway 1A. The total number of people currently supplied with clean water is about 57,700 people, equivalent to 60% population of the town, with a water supply standard of 150 liters/person/day.

2.3.3. Drainage Sewers

Drainage: Besides some resettlement areas in Dong Yen, Ky Lien, Ky Long, Ky Phuong, Ky Thinh where new combined drainage systems will be constructed, Ky Anh Town has not yet invested in a complete and well-equipped drainage system. Most of the existing rain water drainage and sewers have been constructed at the same time with the construction of traffic infrastructure on some roads.

At present, rainwater runoff mainly discharges to rivers and streams (Quyen River, Tri River ...) via existing sluices, ponds and lakes. Main drainage direction is based on natural terrain from southwest to northeast, from high to low, then flow into the local rivers and streams and then into the sea.

Waste water collection and treatment system: There is no wastewater collection and treatment system in the town. At present, wastewater is discharged into the combined drainage system or discharged directly into the ground, local canals, rivers and streams causing environmental pollution.

Figure 18: Domestic Wastewater Causing Pollution

2.3.4. Environmental Sanitation

At present, domestic waste collection and treatment service is available in Ky Anh town but there is no planning on dumping site for solid waste and construction waste. The disposal of stone and soil in Ky Anh Town is done under agreements on dumping at the sites requiring leveling.

At present, in Ky Anh Town, there are 10/12 units in charge of waste collection and transportation including Ky Anh Construction Material and Environmental Management Joint Stock Company and 3 co-operatives collecting wastes in Song Tri, Ky Hoa, Ky Ha, Ky Phuong, Ky Lien wards and 5 waste collectors in Ky Long, Ky Trinh, Ky Hung, Ky Thinh, Ky Ninh. Ky Loi and Ky Nam communes, the environmental sanitation agency for collecting wastes is being established. Quantity of domestic solid waste collected in the area is about 45 tons/day (excluding waste generated from Formosa Site). The percentage of solid waste collected is over 80% (in Song Tri and Ky Lien wards) and over 60% for other wards and communes out of the total amount of 80-100 tons/day. 100% of communes and wards in the town have planned the areas of gathering and transporting wastes as in the new rural construction planning.

Collection equipment: Most communes and wards have set up cooperatives and environmental sanitation units to collect wastes and have purchased some equipments like specialized trucks, dustcart, dustbin and have planned waste gathering and collecting areas.

Transporting and treating solid waste: Waste after being collected by gathering units to the gathering or transferring places will be transported to Hoanh Son waste treatment plant in Ky Tan commune, Ky Anh district.

Solid waste transportation in Ky Anh Town has been done by two units.

- Ky Anh Urban Construction and Environmental Management Joint Stock Company collects daily garbage for 9 wards and communes: Song Tri, Ky Long, Ky Lien, Ky Phuong, Ky Nam, Ky Ninh, Ky Hoa, Ky Ha, Ky Hung and Hung Nghiep Formosa Hung Nghiep Steel Co., Ltd and transports to Hoanh Son waste treatment plant in Ky Tan commune, Ky Anh district.

- Ha Tinh Service and Infrastructure Center (Center) collects garbage for 3 wards and communes: Ky Thinh, Ky Trinh, Ky Loi and transports to Hoanh Son waste treatment plant in Ky Tan commune, Ky Anh district.

2.3.5. Electricity and Lighting System

The power source for Ky Anh Town in general and Vung Ang Economic Zone in particular is supplied by the national grid, through Ha Tinh 220 KV station located in Thach Ha, Ha Tinh with capacity 1x125MVA and Vung Ang 1 thermal power plant.

2.4 Current Status of The Construction Areas of Work Items

2.4.1 The Main Road Connecting Urban Centers

Location	Picture on Current Status	Notable Characteristics
Km 0+000 ÷ 0+450	   **Km 0+00** **Km 0+200**   **Km 0+450**	Connect with the access road to Formosa Industrial Park with low traffic density. The section will be newly constructed via the agricultural land with B = 16m. Replace the existing Quyen bridge with new bridge at Km 0 + 200. There is no accompanying technical infrastructure such as lighting system, drainage, sidewalk, trees, separators. The alignment cut through an existing earth road at two locations as show in the map
Km 0+450 ÷ 2+610	   **Km0+455** **Km1+800**  **Km2+610**	Passing the edge of the residential area and agricultural land in Ky Trinh ward. The agricultural land is mainly left abandoned, not cultivated. The section will affect some resident's houses at the start point in Ky Trinh ward. The section will be constructed with B = 29m, and a new bridge over Cau Bau River at Km1 + 800.

Location	Picture on Current Status	Notable Characteristics
Km 2+610 ÷ 3+390	   **Km2+610** **Km2+830** **Km2+900**    **Km 3+00**	Passing Ky Hung Commune and Ky Chau Commune, and not being a real route at present. Population density is moderate. The section will build a bridge crossing Tri River at Km2 + 900. At present, the two banks of the river have been embanked. Main plants are bamboo trees, pomelo, Barringtonia and bushes. The nearest distance from the resident's house to the road edge is 18 – 35m.
Km 3+390 ÷ 3+750	 **Km 3+390**    **Km 3+750**	The section is not really a road at present but an agricultural production area in Ky Chau commune. The distance from the center line to the nearest house is 90m.

2.4.2 Main Pipeline

Location	Picture on Current Status	Notable Characteristics
NH 1A	 Start of the route Pipeline features: pipeline runs along the road, there is rainwater drainage system, population density is sparse, the distance from the house to the edge of the road is 5 - 10m.	 Km 0+150: The distance from the house to the edge of the road is 5 - 10m.
	 Km 0+620: The pipeline passes through Da Ban bridge.	 Km 0+750: The pipeline passes through Ngay bridge.
	  - Km 0+830: the right-hand pipeline runs adjacently to the temple.	 Km 1+930: The distance from the house to the edge of the road is 5 - 10m.
	 - Km 3+290: The pipeline passes through sub-zone 2, Hung Hoa residential cluster in Song Tri ward, the distance from the house to the edge of the road is 5 - 10m.	  Km 3+650: the right-hand pipeline passes through Ky Anh General Hospital.
	  Km 4+050: The left-hand pipeline passes through the gate of Song Tri Primary School. Km4+710	 Km 4+710: The pipeline passes through Tri bridge. -

Location	Picture on Current Status	Notable Characteristics
	 	Km 4+890: The right-hand pipeline passes the memorial martyr of Song Tri ward.
	 Km 5+550: the pipeline passes through Viet-Lao 3-way intersection.	 Km 6+00: at the end of the collection pipeline along NH1A, at Ky Anh town post office.
Ky Hung communal main road		Km 0+000: Pipeline characteristics: The pipeline runs along the main road of Ky Hung commune, some sections have rainwater drainage sewers, the population density is moderate, the distance from the house to the edge of the road is 0 - 5m.
	 Km 0+250: The pipeline passes through the sub-zone 3, Trung Thuong street in Song Tri ward. The nearest resident's house is 0 – 5m from the road edge.	 Km 0+760: The pipeline passes through Tan Ha hamlet in Ky Hung commune, the nearest resident's house is 0 – 5m from the road edge.
	 Km 1+00: The pipeline passes through Tan Ha hamlet in Ky Hung commune, the nearest resident's house is 0-5m from the road edge.	 Km 1+300: connect with the main pipeline along Hung Hoa residential group.

Location	Picture on Current Status	Notable Characteristics
	 Km 1+560: the pipeline passes through the Martyrs Memorial and Ky Hung Commune Medical Center.	 Km 1+670: the pipeline passes through Ky Hung commune preschool.
	 Km 1+770: the pipeline passes Ky Hung commune ancient well.	  Km 2+050: the pipeline runs along Tri river in Ky Hung commune, the nearest resident's house is 0-5m from the road edge.
	 Km 2+530: The pipeline passes through Tran Phu hamlet, the nearest resident's house is 3 – 5m from the road edge.	 Km 2+960: The pipeline pases through Hung Phu hamlet, the land around is vacant land.
	 Km 3+300: The pipeline passes through Hung Phu hamlet, the nearest resident's house is 2 – 5m from the road edge.	 Km 3+940: Connect with the receiving pipeline of the treatment plant
Concrete road in Hung Hoa residential group connecting with Ky Hung	Km 0+000 	-Pipeline characteristics: The pipeline runs along Hung Hoa residential area connecting the main road of Ky Hung commune, some sections have rainwater drainage sewers, the population density is moderate, the distance from the houses to the road edge is 0 - 5m.

Location	Picture on Current Status	Notable Characteristics
communal main road	 - Km 0+170: the pipeline runs along the concrete road in Ky Hung commune, the nearest resident's house is 1-3m from the road edge	 Km 0+400: the pipeline runs along the concrete road in Ky Hung commune, the nearest resident's house is 1 - 3m from the road edge.
	 Km 0+680: The pipeline passes through Ky Hung commune primary school	 Km 0+930: Connect with the pipeline of the trunk road in Ky Hung commune.

2.4.3 Pumping Stations

Location	Picture on Current Status
Station 1: NH 1A, near Ky Anh town post office.	 
Station 2: NH 1A, near the Ky Anh Market	
Station 3: NH 1A, near Vincom mall.	
Station 4: Km4+011 NH 1A, opposite Thuy Son lake	 

Location	Picture on Current Status
Station 5: Km 3+110, on NH 1A.	 
Station 6: Km 2+750, on NH 1A.	 
Station 7: Km1+655, on NH1A	 
Station 8: Km1+000, on NH 1A.	 
Station 9: Km0+150, on NH 1A.	 
Station 10: Ky Hung commune main road	 

Location	Picture on Current Status
Station 11: Ky Hung commune road, far from the treatment plant	

2.4.4 Wastewater Treatment Plant

Location	Picture on Current Status	Notable Characteristic
Treatment plant		The land for the construction of the wastewater treatment plant is next to the Tri River, under the management of Ky Hung Commune People's Committee. Currently, this land is rented to households for agricultural and aquacultural production. However, the production is at low density, not bring about high economic efficiency.
Access road to the plant		The access road to the current treatment station is Ky Hung commune concrete road. The end of the route (500m) approaching the station is now the trail used by people for their agricultural and production purposes. Traffic density on this road is sparse.
Discharge area		The receiving area of the treatment station is located in the downstream of Tri River, and the receiving river section is 65m wide. It is estimated that the proposed discharge to downstream is not intended for the purpose of domestic water supply. There is aquacultural land located 1km downstream from the treatment plant which belongs to residents in Eoc Bai, Tran Phu village, Ky Hung commune. There is almost no fishing and navigation activities on this river section
Buffer zone		Within the buffer zone of the treatment plant there is the agricultural land and livestock land of some households. Most of the land area is vacant. The nearest resident house is 400m from the safety corridor, belonging to Ky Hai commune, Ky Anh district.

2.4.5 Tri River Embankment

In addition to the task of draining rainwater in the basin, Tri river is responsible for drainage for the annual dam discharge of the Thuong Lake (twice a year) which is overloaded for the river and is affecting people living along the river banks. The river banks have not had solid embankment or embankment with low crest (from +2.5m to +3.0m) so the dam discharge with huge water amount exceeding the river capacity, causing local flooding on both sides of the river (many of which are flooded from 0.5m to 1.0m), particularly the section from Tri river to Tri river bridge in following picture.

Figure 19: Location of The Embankment Section

Location	Picture on Current Status	Notable Characteristic
Right bank	 **Start point**   **Km0+500** **Km1+085**   **Km1+200** **End point**	The section is 1.5km long, not being a real road but mainly as agricultural land of the residents of Ky Hoa commune. Near the river bank is soil shoulder, with bushes and some tall trees. The end section of the route is adjacent to Tri bridge (0.5km) and has been embanked, on which the population is scattered, living 10-15m from the embankment.
Left bank	 **Start point**	The section is 1.5km long, not being a real road but mainly as agricultural land of Song Tri ward. Near the river bank is soil shoulder, with bushes and some tall trees. The nearest resident's house is 60m

Location	Picture on Current Status	Notable Characteristic
	  **Km 650** **Km 1+100**   **Km 1+200** **End Point**	from the river bank. The end section is 500m long. This section has been concretized and the river bank has been embanked.
Weir		Start from the embankment of Tri river. At present its sides are not embanked and river bed is encroached, low elevation. Vegetation along river bank is mainly bushes.

2.4.6 Thuy Son Lake

Thuy Son lake has total area of 1.9ha and is the regular and landscape lake located near area of Song Tri primary school, in center of Song Tri ward. The lake is only fed by natural water from rains. In dry season, the lake is not fed or discharged regularly leading to stagnant situation, causing serious water pollution which affect people and appearance of the town. At present, there is asphalt road surrounding the lake but its bank has not been solidly embanked, landslide is even found at some bank sections.


Figure 20: Current Status of Thuy Son Lake

2.4.7 Quarries

Location	Picture on Current Status	Mitigation Measures for Environmental Impact and Safety Applying at The Site
Cup Coi borrow pit	   	Environmental protection commitment approved at Declaration No. 39/TB-UBND dated 13/07/2017 by Ky Anh town PC. Measures to mitigate the environmental impact at the borrow pit: - For domestic waste water: To construct toilets with septic tanks. - For rainwater overflow: to construct drainage system and settling holes. - Construction Wastewater: to construct sewers and manholes. - Dust and gas emission: to reinforce the roadbed, cover the materials, use the right equipment, full protection for workers. - Daily/hazardous solid waste: to arrange dustbins and contract eligible unit for collection. - Construction solid waste: to store for reusing as leveling material
Mui Doi borrow pit	   	EIA was approved at Decision: 3948/QD-UBND dated 12/10/2015 by Ha Tinh PPC. Measures to mitigate the environmental impact at the mine: - Drilling/digging work: to use good quality drilling/excavating machine, provide protective equipment for workers. - Excavating and hauling work: to reduce the loading dump, avoid shaking, use equipment with right capacity. - Transportation: covering transportation vehicle during transportation, ensure traffic safety.

		- On-site safety: to water the site, provide workers with protection equipment, regularly inspect to avoid landslide. - Domestic wastewater/garbage: to collect and hire eligible unit for treatment
Con Tria quarry	   	EIA approved at Decision: 3378/QD-UBND dated 13/11/2012 by Ha Tinh PPC. Measures to mitigate the environmental impact at the borrow pit: - For domestic waste water: To construct toilets with septic tanks. - For rainwater overflow: to construct drainage system and settling holes. - Construction Wastewater: to construct sewers and manholes. - Dust and gas emission: to reinforce the roadbed, cover the materials, use the right equipment, full protection for workers. - Daily/hazardous solid waste: to arrange dustbins and contract eligible unit for collection. - Construction solid waste: to store for reusing as leveling material

2.4.8 Worker Camp, Temporary Warehouse, On-Site Office

Work item	Location/ Characteristic	Photo
Tri river embankment and Thuy Son lake embankment	Left bank of Tri river, 500m from Tri river bridge Vacant land near the embankment area, 100m from the nearest residential area	
Main central road	Km 0+000 Vacant land near the road to Formosa and inside the residential area.	

Work item	Location/ Characteristic	Photo
	Km 2+610 Vacant land, 50m from the residential area.	
Wastewater collection and treatment plant	In the area for construction of the plant Vacant land inside the treatment plant, 500m from the nearest area.	

2.4.9 Disposal Site

The disposal site for construction material of the project is proposed at Cup Coi mountain in Ky Hung commune, within the Cup Coi borrow pit. At present the site is the exploited area of the borrow pit which requires backfilling. The exploited area of Cup Coi quarry, which is 5-7m deep and area of 3ha. The disposal site will use internal path, drainage system and environmental protection measures which the quarry is applying. The site can accomodate disposal of 1.5 million m^3 of construction wastes and can be accessible by NH1A, Le Quang Chi and NH12C. There is no residential area or sensitive works near the disposal site.

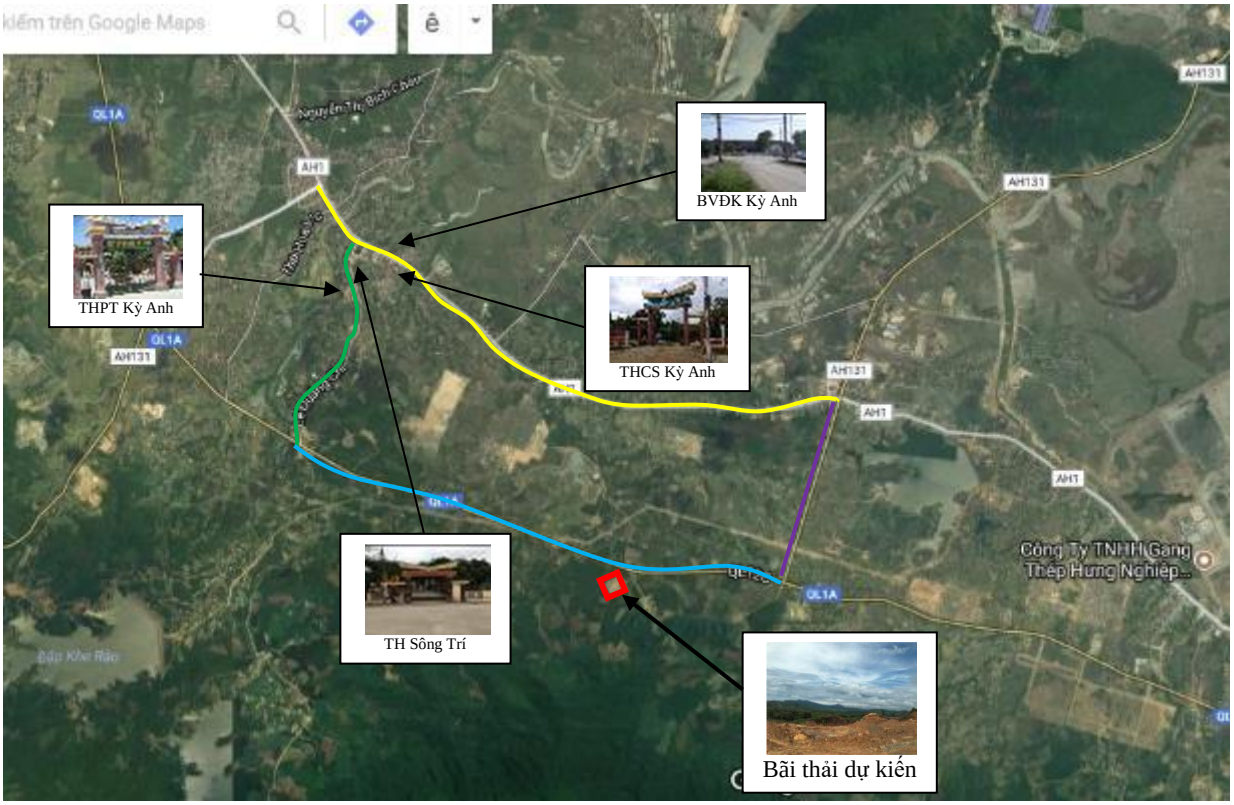


Figure 21: Location of Expected Disposal Sites and Transportation Route

2.4.10 Transportation Route

- National highway 1A: At present, National Highway 1A section passing through Ky Anh town is of relatively good quality and plays the role as the arterial road of the town. The route goes through many sensitive locations of the town such as Ky Anh high school, Ky Anh General Hospital, Ky Anh martyrs Memorial ...
- The roads on two banks of Tri River: the road along Tri river banks is about 500m long at each side with current status as concrete road, 5.5 m wide.
- Ky Hung commune main road: 5m wide concrete road, relatively good road surface.
- Nguyen Thi Bich Chau street: asphalt road 11m wide, many sections have been degraded.
- District road 12: Asphalt road 10m wide, good road surface.

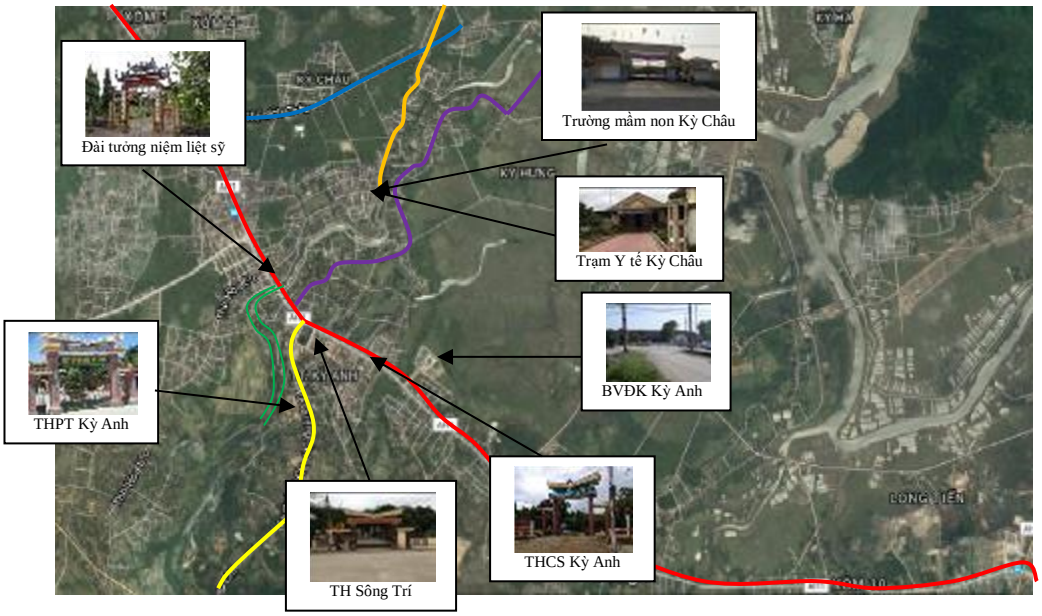


Figure 22: Sensitive Locations on The Route for Waste Transportation and Dumping

2.4.11 Sensitive Locations in The Project Area

List of sensitive works (cultural heritage, historical relic, religious work, school, medical stations…) available in the project area is presented in table 25.

Table 25: List of Sensitive Locations in The Project Area

No	Name/picture	Item	Distance to Construction Site (m)	Description
1.	Song Tri primary school 	Thuy Son lake rehabilitation	10 m	Song Tri primary school is located next to Thuy Son lake, facing the lake via a small concrete road. This area has medium traffic density.

No	Name/picture	Item	Distance to Construction Site (m)	Description
2.	Ancestral worLshipping house Tri river embankment 		30 m	This work is located on the right bank of the Tri River, in Ky Hoa commune. This area has low traffic density
3.	Ancestral worshipping house 	Urban central road	30 m	Nguyen branch Ancestral worshipping house is located in Ky Chau commune.
4.	Ancestral worshipping house 	Urban central road	30 m	This Ancestral worshipping house is located right on the edge of the proposed road, in Ky Chau commune
5.	Ancestral worshipping house 	Urban central road	40 m	This work is located about 40m from the right edge of the central road in Ky Chau commune
6.	Ancestral worshipping house 	Urban central road	30 m	This work is located 30m from the proposed road in Ky Hung commune
7.	Ancestral worshipping house 	Urban central road	5 m	This work is located 5m from the proposed road in Ky Hung commune
8.	Church	Urban central road	400m	This work is located 400m from the proposed road in Ky Chau commune, Ky Anh district.

No	Name/picture	Item	Distance to Construction Site (m)	Description
				
9.	Ancient well in Hieu Chau hamlet 	Urban central road	30m	This work is located 30m from the proposed road in Ky Chau commune, Ky Anh district.
10.	Ancestral worshipping house 	WWTP	5m	This work is located on the route for construction of the main pipeline to the treatment station in Ky Hung commune.
11.	Ancient well in Hieu Chau hamlet 	WWTP	3m	This work is located on the route for construction of the main pipeline to the treatment station in Ky Hung commune.

CHAPTER 3: ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT

3.1. Positive Impacts

In general, the proposed subproject would bring significant positive impacts for the environment and the people in Ky Anh Town. The provisions of the new infrastructure would contribute to socio-economic development in the subproject area, improving urban environment and landscape, benefiting human health. The construction of the trunk urban road would help to improve connectivity between Ky Trinh urban center with the neighboring industrial zones and food supply areas. Local people will be benefited from a healthier and more sustainable living environment. Public health risks related to water-borne diseases in the subproject areas would be reduced after untreated wastewater is collected and treated before being discharged into the environment. Lining the embankment and construction of operational roads along the Tri river would help to reduce flood and inundation at the riverside area. Urban environment and landscape would be improved with the rehabilitation of the Thuy Son Lake and the construction of the wastewater collection and treatment system. The positive impacts of the subproject are detailed as follows:

- The construction of the trunk road connecting urban centers will create an important transport axis, improving connections between the Ky Trinh urban centres with the Formosa Industrial Zone, – the Vung Ang Economic Zone and the southern area of Ky Anh district which is the supply source of food for urban centers and Vung Ang economic zone. Therefore, the construction of the new urban road would contribute to socio-economic development in the subproject area.
- The construction of a wastewater collection and treatment system will help to improve environmental conditions in the serviced area. Untreated urban domestic wastewater would no longer be discharged into the environment thus soil and water contamination are expected to be reduced. Improved sanitation condition would help to reduce health risks related to water-born diseases.
- Lining the embankment of Tri river will help to reduce erosion and landslide risks, improve drainage capacity of the river. This will help to reduce flooding risks for residential areas along the river banks, bring a safer living environment.
- The rehabilitation including embankment lining of Thuy Son lake will not only help to improve environment conditions but also bring about better local urban landscape, contributing to promote socio-economic development in the region. Moreover, the rehabilitation of the lake will contribute to reduce health risk related to water-born diseases after stagnant water is removed from the lake.
- The technical assistance to the subproject owner, authorities and local organizations will help bring efficiency to the operation of the sub-project for sustainable development.

The project's benefits for female beneficiaries:

- The work item of the trunk road connecting urban centres will provide better access to social service, market and job opportunities for people living along the road. The trunk road will also reduce travel time and increase the job opportunities and business activities for women.
- The work item of Tri river embankment and the wastewater collection and treatment plant will help to improve environmental condition, reduce environmental-borne diseases (gynaecological disease, venereal disease…), that will help to reduce medical

check time and treatment cost. Women will have more time and better financial condition to improve their capacity

22,774 people will be benefited directly from the subproject. These are the residents of Song Tri, Ky Trinh, Ky Hoa, Ky Hung wards and communes. The indirect beneficiaries are the people in Ky Anh Town (71,399 people) and Ha Tinh Province (1,261.285 million people).

The business sector will also benefit greatly through improved infrastructure and landscape that facilitate trade and attract investment.

3.2.Identification of Potential Negative Impacts and Risks

The implementation of Component 1 comprising of four major work items listed below will cause number of potential socio-environmental impacts and risks:

- **Construction of the Main Road Connecting Urban Centers,** L = 3.75 km, B = 16m - 29 m, designed speed at 60km/h. Road design includes drainage, tree planting, traffic safety measures. There are three bridges on the route, L = 58 to 82m, B = 16 to 20 m.
- **Construction of the Wastewater Collection and Treatment System** Including 67.5km HDPE sewers D315 ÷ D450, 11 wastewater pumping stations, 3 - 14m^2/station, and a wastewater treatment plant capacity 2,000m^3/day.

- Embankment Lining and Construction of Riverside Road along the Tri River, including lining 2x 1.5km embankments at both side of the Tri river with reinforced concrete slabs and grass confinements. Build operational road with B = 13m and includes lighting, drainage, sewers and trees.

- Upgrading and Rehabilitating Thuy Son Lake–Including (i) dredging of Thuy Son lake with area of 1.9 ha, (ii) constructing the conduit for the lake, lining 2km of embankment, (iii) constructing and rehabilitating the sidewalk, completing technical infrastructure and landscape such as sewer, drainage, lighting system, tree planting.

The implementation of these activities would cause potential negative socio-environmental impacts and risks as identified in Table 1. The potential environmental and social negative impacts are classified as below:

High Impacts (H)

- Impacts on large land areas, important areas, or changes in environmental conditions in a period of more than 02 years.
- Impacts exceeding permitted standards and regulations. Long-term and large-scaled impacts;
- Changes in ecological systems, impacts on ecological systems at large areas, or medium impacts (lasting for more than 02 years) yet required recovery period of the affected ecological systems are 10 years;
- Impacts on health of the human beings;
- Economic losses and damages to the sub-project nearby people and communities.
- Potential significant social and environmental impacts which can only be controlled and mitigated if proper mitigation measures are implemented.

Medium Impacts (M)

- Impacts on large areas for a period from 6 months to 2 years

- Changes in ecological systems or ecological functions at the localities in a short time and recovery capacity are good. The impact levels are similar to current changes, yet such impacts can cause cumulative effect.
- Impacts might (or might not) affect people's health, causing impacts on several persons in the surroundings of the sub-project areas.
- Impacts are medium, localized, and temporary and mitigation measures should be carried out.

Low Impacts (L)

- Social and environmental impacts that cause significant changes yet in less than 6 months or medium changes for a period of less than 2 years.
- Impacts are within permitted standards and regulations, causing minor changes at the present. Impacts are fully controlled;
- Impacts that might affect daily activities yet not cause any obstruction to communities;
- Insignificant impacts on health and living standards of people;
- Impacts are minor, localized, and can be neglected

No Impacts (N)

- Impacts that are unrecognizable or can be identified yet such impacts can also be caused by daily activities;
- No social and environmental impacts

Table 26. Summary of Project's Environmental and Social Impacts

Phases	Physical Environment			Biological Resources		Social Environment				Others	
	Dust, Noise, Vibration	**Soil, Water**	**Solid waste, sediment**	**Terrestrial ecosystem**	**Aquatic system**	**Land acquisition, resettlement**	**Indigenous people**	**Physical Cultural Resources**	**Livelihood, Community Disturbance**	**Flood/ Transport/ Safety**	**Health and safety**
Construction of trunk Road Connecting Urban Centers											
Pre-construction	N	N	N	N	L	M	N	N	L	N	N
Construction	M	M	M	M	L	N	N	N	M	M	M
Operation	M	N	L	N	N	N	N	N	N	L	N
Construction of Wastewater Collection Treatment System											
Pre-construction	N	N	N	N	N	L	N	N	L	N	N
Construction	M	M	M	L	L	N	N	N	L	L	M
Operation	L	L	L	L	L	N	N	N	L	L	L
Embankment Lining and Operational Road Construction on Tri River Banks											
Pre-construction	N	N	N	N	N	L	N	N	L	N	N
Construction	M	M	M	M	L	N	N	N	M	M	M
Operation	N	N	L	N	N	N	N	N	N	N	N
Upgrading and Rehabilitating Thuy Son lake											
Preparation	N	N	N	L	L	M	N	N	M	N	N
Construction	M	M	M	L	L	N	N	N	M	M	M
Operation	L	L	L	N	L	N	N	N	N	L	L

3.3. Potential Negative Environmental & Social Impacts during Pre-Construction Phase

The main potential impacts and risks during pre-construction phase would be: (i) land acquisition; and (ii) safety risks related to unexploded materials left from the war, as discussed in detail below.

3.3.1. Land Acquisition

The implementation of the trunk road, the wastewater collection and treatment system, and the embankment and road on Tri river banks will acquire total 170,258m^2 of land, in which the majority is agricultural land (79.7%). The residential land to be acquired accounts for 14% of total land areas of Ky Hung, Ky Trinh, Ky Hoa communes and Song Tri ward. Land acquisition is not required for the Thuy Son lake. The types of existing land use to be acquired by the sub-Project area are presented in Table 27 below:

Table 27. Land Areas and Types to be Acquired

No.	Work item	Residential land (m^2)	Agricultural land (m^2)			Public land	Total (m^2)
			Annual crop Land	Perennial crop land	Pond		
1	The trunk road	13,578	45,377	0	5840	12,434	71,972
2	WWTP and pipelines	0	45,725	0	0	522	45,725
3	Embankment and road on Tri river banks	5,837	26,248	10,169	492	9,814	52,560
	Total	**19,415**	**117,350**	**10,169**	**1,076**	**22,770**	**170,256**

(Source: Project's RP report, 2017)

Totally, 344 households (HH) would be affected by land acquisition under the Project. As described in Chapter 2, nearly 60% of surveyed affected households (AHs) have main income source from agricultural production. The average monthly income of surveyed AH is about 8.1 million VND/HH and the average monthly expenditure is 5.8 million VND /HH. Therefore, the impacts of land acquisition would be most significant on 91 severely affected households (AHs)[12], particularly the 14 HHs who has to be relocated and 2 other vulnerable severely AH[13] in this group. In addition, the impacts of land acquisition would also be significant on 14 other vulnerable AHs but not severely. The severely affected HH whose main incomes from agriculture may have to find another job to maintain their livelihood. The two-displaced business HHs may have difficulties at early stage after relocation as they have to re-setup their business and attract new customers if they want to maintain their business. Land acquisition is not avoidable but has been minimized during the preparation of this subproject.

Land acquisition under the project will affect 2,140m^2 houses of 35 households. Other assets such as kitchen (440m^2), housing structures (300m^2), stand-alone toilets (240m^2), wall (2,150m^2) and yards (2,340m^2), 35 gates, 12 water tanks and 10 wells will also be affected. The types of affected structures are listed in the Table 28 below.

[12]Severely afected HHs are i) normal HH with from 20% of total agricultural land to be acquired; or vulnerable HH with from 10% of total agricultural land to be acquired;

[13] Vulnerable HHs are either poor HH, female-headed households with dependents, or HH under the care of social policy

Table 28. Structures Affected by the Project

N	Items	House (m^2)	Kitchen (m^2)	Barn (m^2)	Toilet (m^2)	Ground (m^2)	Fence (m^2)	Gate (piece)	Water tank (piece)	Well (piece)
1	Trunk road	1,800	320	120	130	1,890	1,280	30	10	7
2	Wastewater collection and treatment system	0	0	180	0	0	0	0	0	0
3	Embankment and road on Tri river banks	340	120	0	110	450	870	5	2	3
	Total	**2,140**	**440**	**300**	**240**	**2,340**	**2,150**	**35**	**12**	**10**

(Source: Project's RP report, 2017)

In addition to the structures listed above, the Project will also affect public works including two substations, 30 electrical poles, and 1,200m of power wires. The construction of the sewers will also affect 38,766 m of asphalt and concrete roads in Ky Hoa, Ky Huong and Ky Chau communes. The Nguyen Ca ancestral worshipping house will be relocated.

Impact on Cropland and Trees due to Land Acquisition

Land acquisition under the project will affect some cropland and trees. 800 fruit trees and 1,500 timber trees which are currently part of the garden land of households with land acquisition will be cut down. 57,648 m^2 of rice field, 59,703m^2 of annual crop land and 10,332 m^2 of tea plantation will be acquired. Land areas and the quantities of trees affected are summarized in Table 29.

Table 29. Impact on Crops/Vegetation and Trees

No	Work item	Rice field (m^2)	Cropland (m^2)	Tea plantation (m^2)	Fruit trees (tree)	Timber tree (tree)
1	The trunk road	40,402	16,803	163	500	1,000
2	Wastewater collection and treatment system	16,761	28,964	0	0	0
3	Embankment and road on Tri river bank	13,866	12,383	10,169	300	500
	Total	**57,648**	**59,703**	**10,332**	**800**	**1,500**

Source: IOL

To address the potential impacts of land acquisition, the Project has prepared a Resettlement Action Plan (RAP). The main contents of the RAP are summarized in the ESMP presented in Chapter 5

3.3.2. Safety Risks Unexploded Ordnances

The Project area were suffered from wars in the past; therefore, there are risks that some unexploded objects (UXO) such as bombs and mines are still remained under the ground. If not detected or removed before construction is started, these UXO may cause accidents with injuries, even deaths to human, and loss or damages to properties. This high risk is manageable by hiring a specialized unit to carry out mine clearance before handing over the sites to the Contractor as detailed in the Environmental and Social Management Plan (ESMF) presented in Chapter 5.

3.4. Potential Impacts during Construction Phase

The types of activities that will be undertaken during the construction of the works under the Ky Anh sub-project include:

- Site clearance, levelling, setting up camps and site office;
- Mobilize machines and workers to the site;
- Transportation, temporary loading of of materials and fuels at the construction sites;
- Build coffer dams or fences for dredging and excavation in the Tri river, temporary loading of material and waste, excavating slopes, embankment lining along the Tri river; build the riverside roads and footpaths.
- Dredging, excavation at the Thuy Son lake.
- Digging to remove the topsoil, laying the materials to build the foundation for the central road and riverside roads ..., install drains and sewers, build footpaths, install lighting systems etc.
- Drilling, building piers and abutments for bridge construction;
- Transport and dispose the waste, site reinstatement, paved roof embankment of Tri river and Thuy Son lake.
- Filling, compaction t road base and lay rock and asphalt layers for roads
- Excavation, install pipelines, refill along the pipelines.
- Reinstate disturbed surface;
- Transportation of waste to the disposal sites.

The above-listed activities will cause environmental and social impacts during the construction process. Source of impacts and receptors are listed in the Table 30 below.

Table 30. Sources and Main Receptors of Common Construction Impacts

No	Impacts/ Risks	Sources of Impact	Main Receptors	Impact level
1	Air Quality Reduction: increased levels of dusts and exhaust gas, odor, noises, vibration	- Dust generated from excavation, loading/ unloading and transportation of construction materials (such as soil, sand, stones, cement) and wastes. - Gas emitted from exhausts of cars, trucks, excavators, cranes etc. - Bad odor from materials dredged up from Thuy Son lake and Tri River. - Noise from pile driving during construction of bridge and installation of sheet piles, from the engines of construction plants, unloading rocks on temporary material yards,	- People, residential clusters living around the Thuy Son lake, Tri river and the trunk road - People living along the material transport routes (NH1, Nguyen Thi Bich Chau, Le Quang Chi, Ky Trinh – Ky Ninh intercommunal road and Provincial Road No.10); - Workers on sites;	Medium

No	Impacts/ Risks	Sources of Impact	Main Receptors	Impact level
		- Vibration due to pile driving during construction of bridge and road base compaction.	- Infrastructure and Landscape around the construction areas.	
2	Waste water generation	- Stormwater runoff through construction sites containing high contents of sediment; - Domestic wastewater from the workers' camps. - Construction wastewater from washing of vehicles, construction activities, and construction materials preparation.	Surface water sources in the project areas (Tri River water).	Medium
3	Solid wastes generation	- Excavated soil from sewer lines, PS, WWTP and top soil along the road alignment - Dredged materials from Thuy Son lake, Tri river - Domestic waste from workers' accommodation; - Construction solid waste including cardboard, wood scraps, packaging material, waste mortar. - Hazardous wastes (wasted oil or materials contaminated with oil).	The Residents along the sewers, near the PSs, Thuy Son lake, Tri river embankment, and the workers' camps The workers	High
4	Surface Water quality reduction	- Leachate from dredged materials with high TSS; - Storm water runoff around the construction sites contain high TSS; - Wastewater from workers' camps with high BOD, nutrients and e coli; - Wastewater from washing of construction vehicles with high turbidity and oil.	Along the Tri River Bridge construction area of the trunk road connecting urban centers Surface water in Tri river next to the WWTP	Medium
5	Impacts on Biological Resources	- Site clearance at the construction sites of the four work items - Bridge construction and river dredging at Tri river, Quyen river, Cau Bau river,	- vegetation covers and trees; terrestrial species (reptiles) Aquatic lives in Tri river, Quyen river, Cau Bau river.	Low
6	Urban landscape	- Loads of construction materials and waste, particularly bulky items, open channels affect urban landscape negatively.	Thuy Son lake area Residential areas Area along NH1A	Medium
7	Increased erosion and landslide risks	- Deep excavations cause landslide. - Erosion from disturbed ground surface after vegetation cover is removed	Workers, local residents, the public Existing infrastructure	Medium
8	Increased flooding, sedimentation, risks	- loads of materials and waste may disturb and block existing drains;	The residential areas surrounding construction sites of the pipelines and the road	Medium

No	Impacts/ Risks	Sources of Impact	Main Receptors	Impact level
		- Rainwater run-off on elevated ground (WWTP) overflow to the surroundings - the new road disturb existing drainage pattern and cause localized flooding	Agricultural production land surrounding the WWTP and the road	
9	Traffic Disturbance and Increased traffic safety risks	- Trucks used in the Project - Road excavation, temporary parking of construction or loading of materials and wastes. - Road surface partially occupied by materials, open trenches, construction plants and wastes	Traffic means, drivers, pedestrians Local residents The public Traffic in roads to Formosa IP, from NH1 to Ky Ninh Commune and Nguyen Thi Bich Chau road.	Significant
10	Damages to existing infrastructure and or disruptions to related services	- Demolition/relocation of existing structure may cause power cut off - Excavation for pipe trenching may damage the existing water supply pipes, interrupting water supply - Existing electrical wires, internet cables or telephone lines may be damaged by cranes/ excavators. - Road construction affect irrigation canal on agricultural land	The existing infrastructure includes: Power lines, water supply pipes, internet cables, telephone lines, irrigation canal.	Medium
11	Social impacts: disturbance to businesses and daily activities of local people	- Communities are disturbed with construction impacts (dust, noise, traffic disturbance etc.; - Business HH affected with reduced sales/income due to dust, access disturbance; - traffic disturbance - Social disturbance/conflicts related to mobilization of workers from other places - Pollution from construction sites and camps may cause health impact on local communities.	Residents, living along the route Businesses located near the construction sites	Medium
12	Impacts on cultural, historical resources	- Some worshipping houses near construction sites may be affected by construction impacts - Materials and waste loads obstruct access and affect landscape - Artifacts may be exposed during earthwork execution	Nguyen Ca, Nguyen and Vu worshipping houses	Medium
13	Community Safety and Health	- Accidents may happen due on disturbed ground, open holes/ slopes, construction plant and vehicle operations, loading and unloading of construction materials/wastes, usage of electricity and gases, welding etc.	People living near construction sites Business located near construction sites Traffic means on roads disturbed by the Project	Medium

No	Impacts/ Risks	Sources of Impact	Main Receptors	Impact level
		- Increased traffic density cause traffic safety risks increase at construction areas and transportation routes. - The use, storage and handling of electricity, gas, oil - Dust, noise, waste and wastewater from construction sites and along the roads may affect public health.		
14	Health and safety of workers	All construction activities impose safety risks to the workers, particularly: + falling into deep excavated holes + electrical shocks + fall into water from bridge + bitten by insects	the workers	Low

3.4.1. Air Quality Reduction

During construction phase, localised air quality would be reduced with increased level of dust, exhaust gases and bad odour. The level of air pollution would depend on factors such as the quality of roads and vehicles, methods of loading, unloading and gathering materials, weather conditions, terrain, construction method, background conditions of receptors etc. Especially, dust concentrations will be much higher during dry, sunny and windy days. Dust may be from materials dropping off during transportation and dispersed by the wind into the air, polluting areas in the vicinity. In addition, noise level and vibration will also cause some impacts and risks in the project areas.

a. Dust and Exhaust Gas Emission

Dusts are generated mainly from operations such as excavation, backfilling, temporary loading and unloading of construction materials, movement of vehicles on transportation routes. Gases such as NOx, SO_2 and CO comes from exhausts of machinery and equipment such as bulldozers, excavators, generators, rollers, etc.

Dust Generated from Excavation, Backfilling and Ground Leveling

Sutton model can be applied for the calculation and determination of the average concentrations of dust and hazardous gases along the route of material transportation of the construction items of the Project.

$$C(mg/m3) = \frac{0{,}8E.\left\{\exp\left[\frac{-(z+h)^2}{2\sigma_z^2}\right] + \exp\left[\frac{-(z-h)^2}{2\sigma_z^2}\right]\right\}}{\sigma_z.u}$$

In which:

- C – Concentration of pollutants in the air (mg/m^3)
- E – Emission volume from generating sources (mg/ms). E is the calculation results in Table 5 above
- z – Height of design point (m); Given z = 0.5m
- h – Height of road surface in comparison with surrounding ground (m);
- u – Average wind speed in the area (m/s); in Project area in the dry season, u=1.8 m/s, wind mainly Southwest. in the rainy season, u=3 m/s, wind mainly Northeast
- σz – Dispersion coefficient of pollutants in z direction (m).

Table 31. Forecast on the Dust Concentration at Construction Sites

(baseline C = 82-196 µg/m³)

L (m)	W (m)	1.5	3	6	9	12	15	QCVN 05:2013/BTNMT (Average 1 hour) (µg/m³)
		H= 1.5m	H= 3m	H= 6m	H= 9m	H= 12m	H= 15m	
Construction of trunk road connecting urban centers								
5	5	137	121	113	111	110	109	300
10	10	121	113	110	108	108	107	
20	20	113	110	108	107	107	107	
50	50	109	107	107	106	106	106	
Construction of the wastewater collection and treatment system								
5	5	96	89	86	84	84	83	300
10	10	89	86	84	83	83	83	
20	20	86	84	83	83	82	82	
50	50	83	83	82	82	82	82	
Construction of embankment and road on Tri river banks								
5	5	213	200	194	192	191	191	300
10	10	200	194	191	190	190	189	
20	20	194	191	190	189	189	189	
50	50	191	189	189	189	189	188	
Upgrading and Rehabilitating Thuy Son lake								
5	5	197	197	196	196	196	196	300
10	10	197	196	196	196	196	196	
20	20	196	196	196	196	196	196	
50	50	196	196	196	196	196	196	

From the above table, it can be seen that the concentration of dust in the air including the amount of dust dispersed from the site during construction in all categories is within allowable limits. At a distance of 5m, the maximum dust content is 213µg/m^3 for embankment and Tri river bank, which is still below the allowable limit of 300µg/m^3. The lowest amount of dust is the construction of a collection network and wastewater treatment plant. The amount of dust in the air in the items area is within the allowable limits in part because the material and waste volume are not too large while the amount of dust in the ground condition is low (82-196 µg / m3). However, attention should also be paid to the effects of the dust due to the fact that local people have not yet adapted to increasing the amount of dust even though the threshold is still within the allowable limits.

Also note the amount of dust that is generated from the Thuy Son reservoir during dredging. Dredged material will be stored temporarily in the reservoir before being disposed of. If the construction of the dry season and not well shielded, the dust will spread from here.

Dust from Transportation of Construction Material and Wastes

The main route of material and waste transportation are Le Quang Chi, NH1A, Nguyen Thi Bich Chau, Ky Trinh – Ky Ninh and provincial road 10 as shown in Figure 1.

Figure 23: Main Road for Transportation of Material and Waste

The total amount of stone, waste, excavation and backfill material needed for construction of work items in Component 1 is 892,472 tons. These volumes require 50,544 trips of 18-tons trucks. The proposed quarry at Ky Tan commune is 10.2km from Ky Anh town, which is accessible from Le Quang Chi road, NH1A, Nguyen Thi Bich Chau, Ky Trinh – Ky Ninh intercommunal road and Provincial Road No.10.

Table 32. Number of Vehicle Trips for Transportation of Excavated and Backfilling Materials (18-tons Truck)

No.	Work item	Materials (Ton)	Construction Durations (months)	Total Vehicle trips	Daily trips (trip/day)	Transportation Route
1	Trunk road connecting urban centers	395,429	20.8	22,464	36	Nguyen Thi Bich Chau Street, District Road 12a, NH1A
2	Wastewater collection and treatment system	201,155	20.8	11,232	18	NH1A, Ky Hung communal concrete road.
3	Tri river embankment and road	227,254	15.6	12,636	27	NH1A, Le Quang Chi Street, existing roads along the Tri river banks .
4	Thuy Son lake	61,987	15.6	3,744	8	Le Quang Chi Street, National highway 1.
	Total	**885,825**	**72.8**	**50,076**	**89**	

The value of longitudinal pollutant diffusion calculated with Slade model, with atmospheric stability B and distance X(m) between the calculation point and the emission point,, taking into account wind direction is determined with the following formula: $\sigma z = 0.53 x 0.73(m)$.

The calculation results of dust concentrations in the dry season (From October to next April) at distances of X = 25, 50 and 100 meters from the emission source (agreed to be the transportation

road edge) during the transportation of excavated materials and backfilling materials are presented in Table 33 below.

Table 33. Calculated Volumes of Dust and Emission Gases During Transportation of Construction Materials (18-ton Truck)

No.	Work item	Distance (m)	Generated emissions (µg/m.s)			
			Dust ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	CO ($\mu g/m^3$)
			H=3m			
1	Construction of trunk road connecting urban centers	25	112.972	40.125	33.001	827.000
		50	112.935	40.125	33.000	827.000
		100	112.908	40.125	33.000	827.000
2	Construction of the wastewater collection and treatment system	25	112.918	22.333	29.000	654.333
		50	112.900	22.333	29.000	654.333
		100	112.886	22.333	29.000	654.333
3	Construction of embankment and road on Tri river banks	25	112.945	41.667	43.334	1,011.667
		50	112.917	41.667	43.334	1,011.667
		100	112.897	41.667	43.334	1,011.667
4	Upgrading and Rehabilitating Thuy Son lake	25	112.888	56.000	58.000	1,500.000
		50	112.880	56.000	58.000	1,500.000
		100	112.874	56.000	58.000	1,500.000
QCVN 05:2013/BTNMT			**300**	**350**	**200**	**30,000**

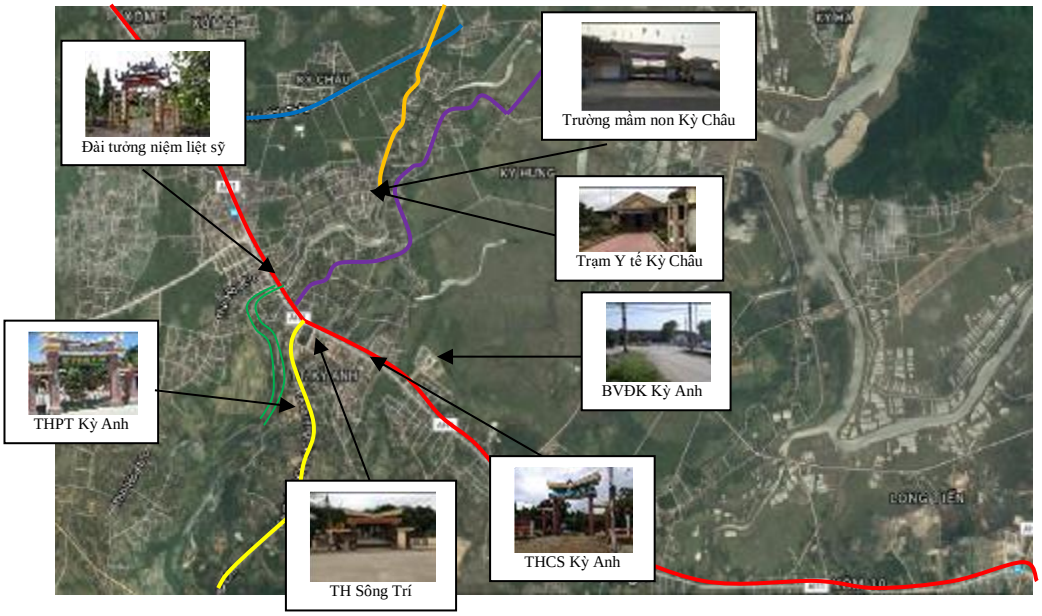


Figure 24: Sensitive Locations on the Route for Waste Transportation and Dumping

Table 34: List of Sensitive Locations in The Project Area

No	Name/picture	Item	Distance to construction site (m)
1.	Song Tri primary school	Thuy Son lake rehabilitation	10 m
2.	Nguyen Ancestral worshipping house	Tri river embankment	30 m
3.	Vu Ancestral worshipping house	Urban central road	30 m
4.	Nguyen Ancestral worshipping house	Urban central road	30 m
5.	Nguyen Ancestral worshipping house	Urban central road	40 m
6.	Le Ancestral worshipping house	Urban central road	30 m
7.	Nguyen branch Ancestral worshipping house	Urban central road	5 m
9.	Ancient well in Hieu Chau hamlet	Urban central road	30m
10.	Ancestral worshipping house	WWTP	5m
11.	Ancient well in Hieu Chau hamlet	WWTP	3m

Remarks on Dust and Emission Gases Generation:

In general, the dust and emission gases concentration in the air on transportation roads (Concentration of emissions from vehicles + background concentration) does not exceed the applicable standards specified in QCVN 05:2013/BTNMT[14]. Dust and emission gases concentrations quickly decreases with increased distances from sources.

However, the above calculations are for the dust generated from the vehicle engines only and do not include dust brought up from road surfaces by moving wheels or from materials or waste dropping/spilling out of vehicle bodies during transportation. The amounts of such dust will be much dependent on tightness of the truck tank, weather conditions, road surface quality, hygiene of vehicles and roads, wind strength. Therefore, impacts from dust generated on these roads are bound to be higher with these additional factors.

In addition, the above calculations are based on the assumption that there are only vehicles of each work item under Component 1 travelling on such roads, emissions from other vehicles travelling on the same roads not included. In reality, dust concentrations could probably increase a lot more than the calculation results. Besides, dust concentrations also depend on the frequency of construction and Contractor's vehicle mobilization at each point of time. There may be times when the construction progress must be sped up, requiring additional equipment, machines and vehicles and impacts from dust will thereby increase.

Le Quang Chi road, NH1A, Nguyen Thi Bich Chau, Ky Trinh – Ky Ninh intercommunal road and Provincial Road No.10 are the main routes for transporting materials and also the arterial roads in the town. Such roads will be more affected by dust from higher flows of traffic means carrying granual materials. Therefore, although according to Chapter 2, the current air quality in the above-mentioned areas is still fairly good. the impacts of dust from Project activities will be significant. Nevertheless, such impacts are only temporary during the construction phase and can be mitigated. Yet, these impacts can only be terminated when the transportation and construction phase of the Project is completed.

[14]QCVN 05:2013/BTNMT – National Technical Regulation on Ambient Air Quality

The affected *subjects will be road users, shops, eating places and households located along the roads*. Dust pollution can contribute to hindering business and service activities as customers would be more willing to choose cleaner places for eating, drinking or buying goods.

Transportation routes are the main roads of Ky Anh town, so there will be some sensitive objects that will be affected by dust during road traffic such as students on the way to school, staff on the way to work and business households trading along the road.

b. Bad Odors

Bad odours would be emitted during dredging and embankment of Tri river and Thuy Son lake. Dredging volume of items is 65,202m^3. The sources of such bad odours are from the gases such as CH_4, H_2S, NH_3, etc. generated from the anaerobic decomposition of organic matters presence in the sediments/soil. Depending on concentration and exposure period, these gases may cause negative impacts at different level to the health to affect local people as indicated as follows

H_2S	
Concentration (ppm)	**Symptoms/Effects**
0.00011-0.00033	Baseline concentration
0.01-1.5	Odor threshold (when the stinky smell is firstly detected). Odor becomes more offensive at 3-5 ppm. Above 30 ppm, odor described as sweet or sickeningly sweet.
2-5	Prolonged exposure may cause nausea, tearing of the eyes, headaches or loss of sleep. Airway problems (bronchial constriction) in some asthma patients.
20	Possible fatigue, loss of appetite, headache, irritability, poor memory, dizziness.

Bad odours during construction are unavoidable at many areas around the construction sites at the Tri river and the Thuy Son lake. There are some households who lives along the banks of the Tri river. Especially, Thuy Son Lake is in the central areas of the city. The area around Thuy Son Lake has some houses, Song Tri primary school, Bao An hotel and some cafes and refreshments. The smell of dredged sludge will affect the households living in that area, students and guests staying at Bao An Hotel near the lake. The impact will be greatest in the early days of new dredging, near the lake and at the end of the wind direction. This potential impact would be unavoidable, self-reduced with time and mitigable.

The dredging operations taking place at least a month from bad odours would temporarily occur within a localized and limited scope with affected subjects being mainly workers, Song Tri primary school, Bao An hotel and residents of Song Tri ward near the lake banks.

c. Increased Noise Levels

Noises can be generated from transportation vehicles, machinery and equipment. Noise level from transportation and construction phases is calculated by following formula:

$$Lp(X) = Lp(X0) + 20 \log10(Xfl/X)$$

Where:

LP(X0): Noise level at 1m from the source (dBA)
LP(X): Noise level at the calculated location
X: Location for calculation X0 = 1m

For each work item, the resonant noise will be estimated from individual noise level of machinery and equipment. The resonant noise is calculated by following formula:

$$Ly = 10 \times Ig\,1\,0\,°'1Li$$

Where:

-LI: Resonant noise level
-Li: Source of noise i
- n : Number of source of noise.

The chosen distance for assessing the noise impact in the surrounding residential area is from 0m-150m.

Table 35. List of Machinery and Equipment for the Project

No.	Machinery	Work items			
		Embankment of Tri river	Embankment of Thuy Son lake	Trunk road connecting urban centers	Wastewater collection and treatment system
	Single-bucket excavator, capacity 0.8m^3	2	1	2	2
2.	Bulldozer 108 CV	2	0	2	2
3.	Self-propeller grader 108CV	2	0	2	3
4.	Power shovel 2m^3	2	1	2	3
5.	Vibrating roller 10T	2	0	2	2
6.	Pneumatic roller 16T	2	0	2	2
7.	Watering car 5m^3	2	1	2	2
8.	Crane 130T	2	1	2	2
9.	Mortar mixer	2	1	2	2
10.	Water pump	2	1	2	2
11.	Asphalt paver	2	0	2	2
12.	Pile driver	2	1	1	2
13.	Generator	2	1	2	2
14.	Haul truck	2	1	2	2
15.	Steel bending machine	2	1	2	2
16.	Welding machine	2	1	2	2
17.	Welding transformer	2	1	2	2
18.	Rammer	2	1	2	2
19.	Concrete breaker	2	1	2	2

The assessment results of the individual noise levels generated by construction vehicles and personal traffic means as well as resonant noise levels are estimated and shown in the Table 36 below.

Table 36. Noise Generated by Construction Machinery and Equipment

Item	Quantity of Machinery	Distance from the source (m)						
		1	15	30	60	90	120	150
Construction of trunk road connecting urban centers	37	105.21	79.3	72.7	66.09	62.22	59.468	57.34
Construction of the wastewater collection and treatment system	40	106.52	80.6	74	67.40	63.53	60.778	58.65
Construction of embankment and road on Tri river banks	38	106.47	80.6	74	67.35	63.48	60.728	58.60
Upgrading and Rehabilitating Thuy Son lake	14	102.93	77.1	70.4	63.81	59.94	57.188	55.06
QCVN26:2010/BTNMT (6h-21h)		**70dB**						
QCVN26:2010/BTNMT (21h-6h)		**55dB**						

Calculated results from construction machines show that at 60m distance from source, the noise is within the limit of QCVN 26: 2010 / BTNMT. At distance of less than 30m, noise level may exceed allowable limits at the construction sites of three work items except the Thuy Son lake. This is due to the smallest number of construction machineries used at this site is much smaller than the other construction sites. As there are some local houses and sensitive receptors such as temples located right at distance of 20m from the edge of constructions area, these will be affected by the elevated noise level due to construction activities in certain times. The impacts can be assessed as small to moderate. The most sensitive receptors to noise are presented in Table 37

Table 37. Noise Sensitive Receptors

Items	Objective	Distance to construction site (m)	Noise	
			Day	Night
Embankment and road on Tri river banks	Nguyen Family worshipping house	30	x	x
Trunk road connecting urban centers	Vu Family worshipping house	30	x	x
	Nguyen Family worshipping house	40	x	x
	Nguyen Family worshipping house	5	x	x
Wastewater collection and treatment system	Le Family worshipping house	5	x	x

Cultural houses are often closed, only open when there are intermittent activities, so not sensitive noise points. The distance from the construction site of Thuy Son lake to Song Tri Primary School and Bao An Hotel is over 30 meters from the Thuy Son lake, so noise level at the school and the hotel should be within allowable limits most of the time during construction phase. However, noise level close to allowable limits may cause nuisance for hotel guests in early morning and late at night and to the children during school exams time.

The potential impacts of noise are medium and manageable about the mitigation measures are discussed in detail in Chapter 5.

d. Vibration

During the construction process, operation of the construction equipment and machineries can cause ground vibration. This vibration propagates in the soil environment, but will be drastically reduced by distance.

Construction equipment includes types of pile driving machine, compactor, bulldozer, heavy trucks as shown in the two tables below. The distance that can be significantly affected by

vibration is about 10 meters from the source.

Table 38. Vibration Level Caused by Some Types of Construction Machineries

No.	Machinery/Equipment	PPV at 7.62 m	Lv at 7.62 m
1	Compressed pile driving plant		
	+ High level	**0.463**	112
	+ Normal	**0.196**	104
2	Compactor	0.064	**94**
3	Pile hammer	0.027	**87**
4	Bulldozer	0.027	**87**
5	Boring machine	0.027	**87**
6	Heavy truck	0.023	**86**
7	Drill	0.011	**79**
8	Small truck	0.001	**58**

Source: D.J. Martin. 1980, J.F. Wiss.1974, J.F. Wiss. 1967, David A. Towers. 1995.

Table 39. Effects of Vibration

NO.	Description	PPV (mm/s)	Approximate Lv (VdB)
1	Reinforced concrete, steel, wood (without plastic)	0.153	102
2	Engineered concrete, conventional masonry work (without plastic)	0.092	94
3	Non-engineered wood and large masonry work	0.061	98
4	Sensitive structures under vibration	0.037	90

Source: Swiss Consultants for Road Construction Association, "Effects of Vibration on Construction," VSS-SN640-312a, Zurich, Switzerland, April 1992

Road compaction and pile driving are likely the most popular activities that cause vibration during construction phase of the project. Vibration cause people to feel uncomfortable or even unsafe. As the majority of households located along Urban Central Road are distance of 15 - 30m from the construction sites, the potential impacts of vibration onto local residents would be limited.

Vibration may also affect the stability of existing structures. There are existing structures that such as grade 4 (one story) houses/buildings located within 5-10 m from road expansion construction sites in Hieu Chau hamlet, Ky Hung commune, Ky Chau commune. These structures may be at risks, cracks may occur due to vibrations during road compactions.

The level of impact of construction activities on air quality is moderate and can be mitigated by appropriate mitigation measures.

3.4.2. Wastewater Generation

The main sources of wastewater generated during construction phase are as follows:

- Surface runoff passing construction sites bring along suspended materials and waste to the canals, lakes and other surface water sources around the sites;
- Domestic wastewater generated from worker's camps containing high BOD and nutrients affecting water quality at receptors such as canals, lakes and other surfacewater bodies around construction sites;
- Construction wastewater containing high turbidity, some oils and grease may also affect water quality at receptors

a. Surfacewater Runoff

Surface runoff is mainly formed from rainwater overflowing on ground surface before following existing drains to receptors. If drainage is inadequate, surface runoff may cause localised flooding. After flowing through disturbed areas, surface would become very turbid and contain high contents of suspended materials. Parts of the solids would be deposited along drains, the majority remaining parts would be brought to receptors such as canals, lakes and other surface water bodies around construction sites. Surface runoff with increased turbidity and suspended solids would cause water quality reduction and sedimentation. Surface runoff through camps, if without proper management, would take along domestic waste (wastewater and solid waste) generated by the workers, polluting surface water.

To calculate the volume of storm water runoff through construction sites under the Project, the following formula[15] can be used:

$$Q = \Psi \times F \times q \ (m^3/s)$$

Where:

Q: Volume of runoff (m^3/day);
Ψ: flow factor, depending on surface characteristics, slope ...
Based on the surface characteristics of the project area, the coefficient Ψ = 0.3
S: Catchment area (m^2)
q: rainfall intensity = 166.7 x i (mm/minute), i is the highest water layer of this area in the wettest month.

According to the hydrological data of the area, the highest rainfall in September is 519.1 mm (Chapter 2), and the wettest month with an average of 17 rainy days,5 hours raining per day, inferred i = 0.1 mm/min.

By using the above formula, the average storm water runoff for rainy days through construction sites under the Project is calculated as follows:

Table 40. Calculation of Average Rainwater Runoff for Raining Days at Construction Sites under the Project

NO.	Work item	Area of the construction site (m^2)	Rainwater runoff volume (m^3/s)
1	Wastewater collection and treatment system	50,000	1,58
2	Upgrading and Rehabilitating Thuy Son lake	19,000	4,17
3	Disposal sites	40,000	3,33

Calculations in Table 40 above were made for the rehabilitation of Thuy Son lake, wastewater treatment plant and disposal sites only, where construction area is centralised. Surface runoff is not calculated for aligned or very small construction sites such as sewer, pumping stations and roads. Due to construction area along the riverbank and lake with a total construction area is not great at every moment, the amount of runoff rainwater through the construction area is quite reasonable (1.58 – 4.17 m^3/s). Thuy Son lake has been deposited, the dry season is often dry. However, this is a sunken area, so the rain water is often gathered here after rain. In the area of the plant, the current drainage capacity is not good, when consulted people said this area or waterlogged. It is therefore likely that surface runoff will continue to cause flooding in the area after the foundation is elevated to build the plant. On the other hand, the surface flow after passing through the factory area during construction will have turbidity and high suspended

[15]Extracted from TCVN 7957:2008- Drainage – Network and External Works – Design Standards

solids due to heavy sediment. Without adequate mitigation measures, there will be potential flooding in the surrounding area and sedimentation at the receiving end is inland channels and finally the Song Tri.

The impacts from storm water runoff during construction could be considered as medium level and require strict management measures.

b. Domestic Wastewater

It is expected that 40 workers will be mobilized for the work items of Tri River embankment and Thuy Son lake, 50 workers will be mobilized for the construction of the trunk road and 50 workers are for the construction of the wastewater collection and treatment plant. So at the peak construction period, the project will have 140 workers working on all packages if all the work items are executed concurrently. The norm for water use demand is 70 liters/person/day. The contractor will prioritize the hiring of local workers, so the amount of domestic wastewater generated on site will be minimized. Domestic wastewater discharge is about 90% of the water used. Based on the number of construction workers and the mentioned waste generation factor, the forecast of daily effluent and wastewater discharge is follows:

Table 41. Generated Domestic Wastewater

No.	Work item	Number of workers (people)	Wastewater volume (m^3/day)	Wastewater volume (m^3/week)	Wastewater volume (m^3/month)
1	Tri river embankment and Thuy Son lake rehabilitation	40	2.8	16.8	72.8
2	Construction of trunk road connecting urban centers	50	3.5	21	91
3	Wastewater collection and treatment system	50	3.5	21	91
	Total	140	9.8	58.8	254.8

The domestic wastewater contains high content of suspended solids, organic matters, nutrients and microorganisms. Pollutant load in the wastewater without the collection and treatment system is presented in following Table 42:

Table 42. Pollutant Load in Domestic Wastewater

NO.	Pollutant	Load (kg/day)
1	BOD_5	0.45-0.54
2	COD	0.702-1.02
3	TSS	0.7-1.45
4	T-N	0.06-0.12
5	T-P	0.008-0.04
6	Cl^-	0.04-0.08
7	E coli	10^5-10^6

(Source: WHO, 1993)

Thus, the total volume of domestic wastewater generated from the worker's camps during construction phase will be from 2.8 to 3.5 m^3/day or 72.8 to 91 m^3/month at each camp. The calculations show that the volume of wastewater generated per day in each camp is not large. However, if proper management measures are not in place, the amount of wastewater discharged from the camp will be from 16.8 to 21 m^3 per week, and in a month will be 72.8 to 91 m^3. Environmental pollution would be serious if such volumes of wastewater become stagnant, accumulates around the area camp. Stagnant water would make the areas surrounding

the camps become unhygienic, causing nuisance, surface water pollution. Stagnant wastewater would become breeding ground of mosquitoes and affect the health of the workers and the public. At present around a camp shack there is vegetation covered carpet, if the domestic wastewater (with the BOD and the relatively high N, P) accumulates, it will affect aesthetic value of the area, and pollute the soil, make the grass overgrowth, creating favorable conditions to attract water-borne disease vectors. After a period of time, stagnant water may cause the grass to dye. The decomposing grass would make the stagnant water even more heavily polluted. These factors will adversely affect the health of the community and workers. The contractor should take measures to manage the amount of wastewater.

In fact, the risks related to the wastewater from worker's camps is manageable by piped or closed drains, and septic tanks built underground at the camp site. On the other hand, bidders can actually rent a number of dwellings in small groups rather than in the same house. The amount of wastewater discharged from each worker's dwelling place will be lower than the calculated volume in Table 41.

Therefore, the impact of domestic wastewater is considered to be medium.

c. Construction Wastewater

Construction wastewater is generated from activities such as washing of materials, cleaning of machines & equipment, concrete curing, etc. The construction wastewater would contain some soil, sand, and high contents of suspended materials, and possibly even oil and grease. The volume of construction wastewater generated would be subject to many factors such as land area of construction site, time of the year, workers' awareness, construction method and technology applied, and the quality of construction materials, etc.

Construction wastewater could also be generated from washing and mixing materials and concrete maintenance. Wastewater from concrete curing would contains sand and suspended materials but only generated in hot and dry days in very limited quantity. This wastewater from concrete curing can be used to water the sites to reduce dust.

In general, the construction wastewater mostly comes from the washing of trucks at the construction sites. Every time a truck gets out of the site, dust and soil must be flushed. With an average of 10 litres of water needed to wash a wheel, an amount of 60 litres of water will be used in wheels washing. The daily amount of wastewater needed for washing wheels at construction sites can be calculated as follows:

Wastewater amount (m^3) = Number of truck trips * (60/1000) (m^3)

The calculations of wastewater amount generated at construction sites from excavation, backfilling and ground-levelling operations are presented in Table 43 below.

Table 43. Calculations of Wastewater Generated from On-Site Wheel Washing during Excavation, Backfilling and Ground-Levelling Stage

NO.	Work item	Total material volume (m^3)	Construction days	Total vehicle trips	Washing water (m^3)	Daily wastewater amount (m^3)
1	Construction of trunk road connecting urban centers	219,683	624	22,464	1,348	2.2
2	Wastewater treatment plant	111,753	624	11,232	674	1.1

NO.	Work item	Total material volume (m^3)	Construction days	Total vehicle trips	Washing water (m^3)	Daily wastewater amount (m^3)
3	Embankment and road on Tri river banks	126,252	468	12,636	758	1.6
4	Thuy Son lake	34,437	468	3,744	225	0.5
5	Total	492,125	2,184	50,076	3,005	5.3

Wastewater from wheel washing often contains soil, sand and suspended materials but no oil or grease.

The washing of whole trucks is expected to be done every 5 days for each truck, subject to the weather conditions and how dirty a truck is. Cleaning of whole trucks will be performed at professional car service stations in the city, not on the construction site. Each cleaning time is estimated to require about 200 litres of water for each truck. Wastewater from truck washing would include soil, sand, suspended materials and oil. Therefore, the preliminary treatment of wastewater from washing trucks, in addition to sedimentation manholes, would also need oil and grease separating tanks.

The impacts from construction wastewater during construction could be considered at medium level and require proper management measures.

3.4.3. Solid Waste Generation

a. Excavated and Dredged Materials

It is estimated that ground levelling and excavation for the construction of the items in Component 1 of the Project would generate a total of 492,125 m^3 of excavated materials, in which 65,202 m^3 is top-soil/dredged materials. The quantity of dredged and excavated materials generated from each item are listed in Table 44 below:

Table 44. Excavated Materials (Unit: m^3)

Items	Demolition	Excavation	Levelling	Dredge	Total
	m^3	m^3	m^3	m^3	m^3
Trunk road connecting urban centers	14,642	31,681	159,074	14,285	219,683
Wastewater collection and treatment system	1,000	23,282	69,823	17,648	111,753
Embankment and road on Tri river banks	4,881	10,560	106,049	4,762	126,252
Thuy Son lake	120	4,695	1,116	28,507	34,437
Total	20,643	70,218	336,062	65,202	492,125

It is noticeable that the construction of Thuy Son lake and Tri river embankment will generate a volume of dredged materials at 28,507 m^3 and 4,762 m^3, respectively. Analysis results on the four soil samples taken in the project area show that, contents of heavy metals (Pb, Zn, As, Cd, Zn) of all samples are within allowable limit in QCVN 03-MT:2015/BTNMT. Therefore, the excavated materials are reusable. An estimated 50% (32,601 m^3) excavated material will be reused for backfilling or ground levelling. The excavated/dredging materials if not reused will be transported to disposal sites. Some environmental concerns would be arisen at temporary loading of excavation and dredged materials. These include wastewater leaked from wet/damp dredged materials, odours from muds, dust from dry granual materials. Environmental issues

at final disposal sites (at Cup Coi borrow pit) include high erosion potentials, landslide risks, localised flooding etc. which will be discussed in a separate section in this Chapter.

The impacts of solid waste from dredged materials and excavated soil could be considered at high level and require strict and suitable management measures.

b. Construction Solid Waste

Solid waste from construction operations includes waste from construction materials such as packing materials including cement bags, scrap iron and steel, wooden chips, empty boxes, etc. This waste is composed of inert and non-hazardous substances, with some being able to be recycled for other purposes.

According to Document No. 1784/BXD-VP dated 16 August 2007 by the Ministry of Construction, construction solid waste generated from construction of the Project would be about 8.9 tons (178 tons (materials) * 0.05 % = 8.9 tons of construction waste). These volumes of construction waste would have to be collected daily on site, collected and handled in accordance with legal regulations.

The impacts from construction solid waste could be considered as high and require strict management measures.

c. Domestic Solid Waste

The number of workers living in worker camps will be about 140 people if all work items are implemented at the same time. Each worker during working hours on site is estimated to generate about 0.5kg of domestic solid waste a day, i.e. total solid waste generated per day is 70kg. Without proper management, this volume of domestic waste can become a source of pollution, cause bad ordor and bacteria-borne diseases. Amount of domestic solid wastes generated from the workers is estimated in Table 45.

Table 45. Generated Domestic Solid Waste

NO.	Work item	Number of workers	Domestic solid waste (kg)/day	Domestic solid waste (kg)/week)	Domestic solid waste (kg)/month
1	Trunk road connecting urban centers	50	25	175	650
2	Wastewater collection and treatment system	50	25	175	650
3	Embankment and road on Tri river banks and Thuy Son lake	40	20	140	520
5	Total	140	70	490	1,820

According to the calculations in this table, the volume of domestic solid waste generated daily at each camp site of the Project would be from 20-25 kg/d, which is manageable. However, in the absence of proper management and daily collection, With the amount of waste generated from 140-170 kg / week or 520-650 kg / month in each camp, the environment will be polluted by odor, gas, leachate generated when garbage decay. Garbage without adequate control will also cause community discomfort, water pollution, attracting insect and pathogenic organisms that can lead to health risks for the community. However, pollution from municipal waste from the camp will be less likely to happen because as discussed in Chapter 2, all the wards in the project area are currently being Urenco provide collection services and solid waste disposal, contractors may contract for garbage collection in the camp.

The impacts of domestic wastes could be considered at medium level.

d. Hazardous Waste

Hazardous wastes generated under the Project include waste oil, materials contaminated with oil, oil containers etc. Used oil is classified as hazardous waste according to the regulation on management of hazardous waste. The amount of discarded oil and grease generated during the construction process is subject to the following factors:

- Number of means of transport and construction on site;
- Amount of oil and grease discarded from means of transport and construction;
- Frequency of oil replacement and machine &equipment maintenance.

On average, the volume of oil discarded from means for transportation and construction is about 7 litres for each replacement. The frequency for oil replacement and machinery maintenance is every 3 months. The number of transportation vehicles and construction machines which need oil replacement mainly utilized at Project sites at a same time is 53 (including 15 trucks and 38 construction equipment). Therefore, the total average volume of discarded oil and grease generated at construction sites is: (53 vehicles x 7 litres/time)/3 months = 123 litres of discarded oil /month. In addition, the construction can generate oily cloth and oil containers of about 60kg/month.

If without proper management, this volume of hazardous wastes, especially oily waste would cause soil and surface water pollutions. In fact, the amount of hazardous waste generated on the site will be very limited, mainly waste oil from the small construction machinery such as generators, mops ... due to major repair activities, maintenance Periods will only be conducted at registered professional workshops and garages, not on site.

The impacts caused by hazardous wastes can be considered as medium level.

3.4.4. Surface Water Quality Reduction

In the project area there are main surface water sources as Tri river, Quyen river, Cau Bau river and Thuy Son lake. The water quality of these water sources may be reduced by wastewater and waste from worker camp, by surface flow from the construction site or temporary site for construction material /waste, or by the use of surface water (tool washing) during construction. The affected water quality parameters will include TSS, BOD, N, P, oil and grease, coliform depending on the cause of water quality degradation.

Surface water quality degradation due to sewage and waste from camps. The wastewater from workers' camps would mainly contribute additional BOD, nutrients and pathogens to the receptors which nearby the workers' camps of the Tri river embankment, bridges on the trunk road and the WWTP. The water quality in that source may be affected by 2.8 to 3.5 m^3 of domestic wastewater or a 70 kg of household waste generated from the camp every day. When that source water quality deteriorates, the concentration of SS, BOD, nutrients, oil and grease etc. in river water there would be increased. Decomposition of organic matters in the water lead to DO reduction and some toxic gas may be released. This leads to the overgrowth of fungi that feed on mosquitoes, mosquitoes, insects and the risk of infectious diseases.

Surface water quality deterioration caused by Stormwater runoff: Surface runoff has high turbidity and suspended solids after running through construction sites. Particularly, the construction site of the WWTP works on an area of 5 hectares, only 100 meters from the Tri River. The site will be disturbed a lot in the first phase by removing the soil and fill the ground to the design altitude, large amount of excavated soil and fill material (110,753 m^3) will be temporarily located here. In case of rain, some materials will be swept along the surface flow to the Tri River, increasing turbidity, total suspended solids TSS and can cause sedimentation of river bed.

Similarly, some road sections are also near the Quyen and Cau Bau rivers (see map). Stormwater runoff can lead to dug or excavated soil, which increases the turbidity of these water sources.

Some construction activities, especially dredging will also degrade surface water quality. Prior to dredging, the river bed near the shore would be enclosed, and water in that area would be pumped into the river. During the pumping process, the river bed will be agitated, partly in the water to make turbid water, the suspended solids content in the local area will increase. When that water is pumped into the river will degrade the Tri river water. In addition, leaks and stormwater runoff over dredged material during temporary drilling on river banks will drift back to the river, which will also increase the turbidity of the water.

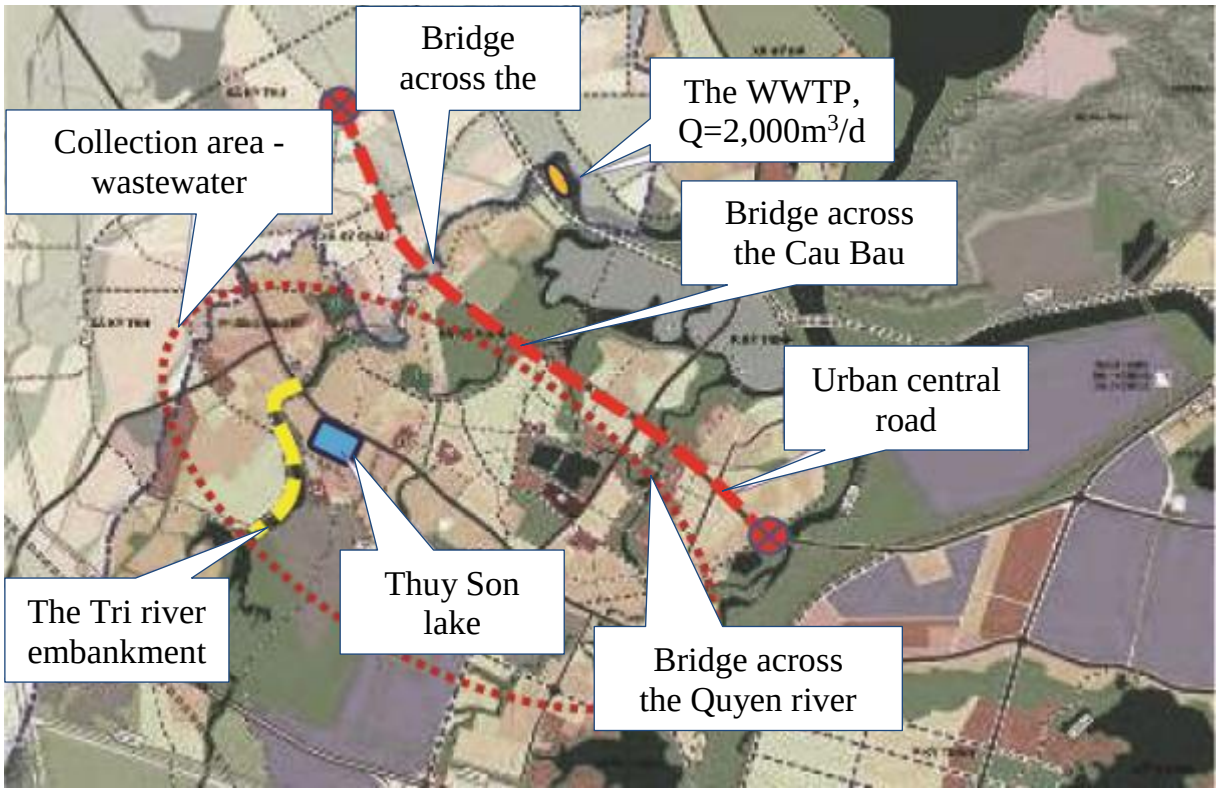


Figure 25: Map of Investment Items of Project

Baseline data on surfacewater quality of the Tri rivers (Chapter 2) shows that TSS in one surfacewater sample nearly reach the allowable limit and one sample already exceed standard (40.3 and 72.1 mg/L which allowable limit is 50 mg/L). Therefore, significant addition of solids from construction sites may lead to TSS contents in water bodies in Project area exceeding standard. Increased turbidity will interfere with the photosynthesis of aquatic organisms, suspended solids in high water will affect the respiration of aquatic animals. Suspended solids can also cause sedimentation of river beds. Especially in the lower Tri River, about 1,500 m away from the WWTP, aquaculture ponds are available, if the turbidity and the suspended solids are too high can affect the growth and productivity of aquaculture.

The construction of bridges spanning Tri River, Quyen River and Cau Bau River may adversely affect the river water quality when bentonite and aggregate materials on either side of the bridge fall into the river or are washed by rainwater into the river. As the main contents of bentonite is clay, bentonite, if not properly managed, would also mainly cause increased turbidity at the receiving surface water bodies.

As the water bodies in the Project areas is mainly for drainage and irrigation, water quality degradation would mainly cause sedimentations in drainage/irrigation channels.

Limited aquatic flora and fauna in these water bodies may also be affected.

Impacts on Water quality of Bentonite generated from Bridge Construction sites

The Project would build three new bridges along the main road connecting urban centers. Bentonite solutions will be used for the construction of abutment foundations, piers and bored piles. During this construction phase, some bentonite solution with high solid contents will be generated at amount depending on the number of piles to be drilled andtheir depths. Data given in Table 18 below shows that the bridge over the Tri River and Cau Bau River will generate more bentonite than the Quyen River by about 100m^3.

Table 46. Volume of Bentonite Generated from Bridge Construction Sites

Bridge	Bridge crossing the Quyen river	Bridge crossing the Tri river	Bridge crossing the Cau Bau river
Length (m)	60	82.2	82.2
Location (Km)	Km +0.200	Km 1 +800	Km 2+900
Betonie Vol. (m^3)	110	160	160

Bentonite solution generated from drilling activities at bridge construction sites may lead to increases in water turbidity thus could affect negativily on aquatic species, particularlythe benthic. Some aquatic species may also be affected by drilling and excavation activities for the constuction of bridge abutments.

The risks on water quality degradation is at medium level and is manageable.

3.4.5. Impacts on Biological Resources

As presented in Chapter 2, the Project areas has been modified extensively by human activities. As agricultural activities land is dominant, there is no known rare, vulnerable or endangered species in the area. Therefore, the impacts of construction activities on biological resources would be very limited when some trees and vegetation cover are cleared for site clearance or when the Tri river bed are disturbed with dredging activity.

Trees and vegetation to be cleared include: 800 fruit trees, 1,500 timber trees, 57,648 m^2 of rice field and 59,703 m^2 of crop land. These trees and crops but mainly of economic value and are not of high biodiversity value. Some existing trees and small area of bushland along the Tri river will also be cleared but not included in the inventory for compensation as these are currently on public land.

During construction phase, there is a risk that that the existing trees and vegetation cover are over cleared or damaged by activities such as temporary loading of materials and wastes, construction of camp and site office construction etc. Such potential impacts can be avoided or minimized.

The potential impacts on aquatic lives would also be limited, there is no know valuable aquatic species in the project area. As discussed earlier, dredging and bentonite solution generated from drilling activities at bridge construction sites may lead to increases in water turbidity thus could affect negatively on aquatic species, particularly the benthic. Some aquatic species may also be affected by dredging, drilling and excavation activities for the construction of bridge abutments. However, this risk is small as pile drilling period is relative short, construction areas under water are usually small and bound.

Habitat lost would be limited at the areas of pile and abutment construction areas which is estimated at about 6,040 m^2. Habitat lost at short bridge construction sites would be negligible

as there will be no pile constructed on waterway but only two abutments will be built on the two banks of the stream.

Table 47. Photos of vegetation along the Tri River

Location	Picture on current status	
Right bank		
	Startpoint	**Km0+500**
Left bank		 **Km 650**
	Start point	
		
	Km 1+100	

For Thuy Son lake, impact on biological resources is negligible due to the fact that, the lake bed is sedimented and usually dries in dry season, it is fed mostly with rainwater in rainy season due to very limited hydrological connections to surrounding area because culverts are also blocked. Some existing tree on the footpath surrounding the Thuy Son lake can be affected by construction machinery such as movement of trucks, cranes and bulldozers in the area. Some trees on the sidewalk may be affected when construction machinery such as trucks, cranes, excavators move around the construction site.

With the Tri river, from the start point to the km0 + 500 and km0 + 650, the river bed is usually dry in dry season, with some bushes along the river bank. Further inland from river bank is agricultural land. Dredging would remove some of the habitats of some underwater creatures and some reptiles in the dredging and riparian areas. However, habitat loss would be very limited as dredging only take place near the embankment. Dredging will not be implemented in much large parts of river bed. On the other hand, there is no know rare, vulnerable or endanger species in the project area thus the impact on habitat loss is negligible.

In addition to dredging work, construction of road along the embankment will also affect vegetation system. The wider area for operation of machinery and for temporary gathering of material, the more area of vegetation will be lost. 5,837m^2 of residential land will be acquired for construction of the road along the embankment but no household will be relocated.

Level of Impact: small, mitigable and can be controlled by mitigation measures.

3.4.6. Impacts on Urban Landscape

Urban landscape would be affected negatively during construction phase due to the placement of fences, temporary loading of construction materials and wastes, particularly bulky pre-cast pipes, narrowing down road surface, open trenches for pipeline installation.

The negative impacts on urban landscape would be mostly significant in the areas around the Thuy Son Lake where the Song Tri Primary School is facing to the lake at one corner, the Bao An hotel is located at the other corner on Le Quang Chi street, number of shops are located on roads NH 1 and Le Quang Chi road. Therefore, construction of the sewers along the NH1 passing the center of Ky Anh town would also affect the landscape in this area considerably.

In addition, there are some historical and cultural buildings such as temples, cultural houses, memorials ... which are sensitive to the impact on the landscape. Activities such as temporary gathering of waste, construction materials can cause significant impact to the landscape in the area near the monuments.

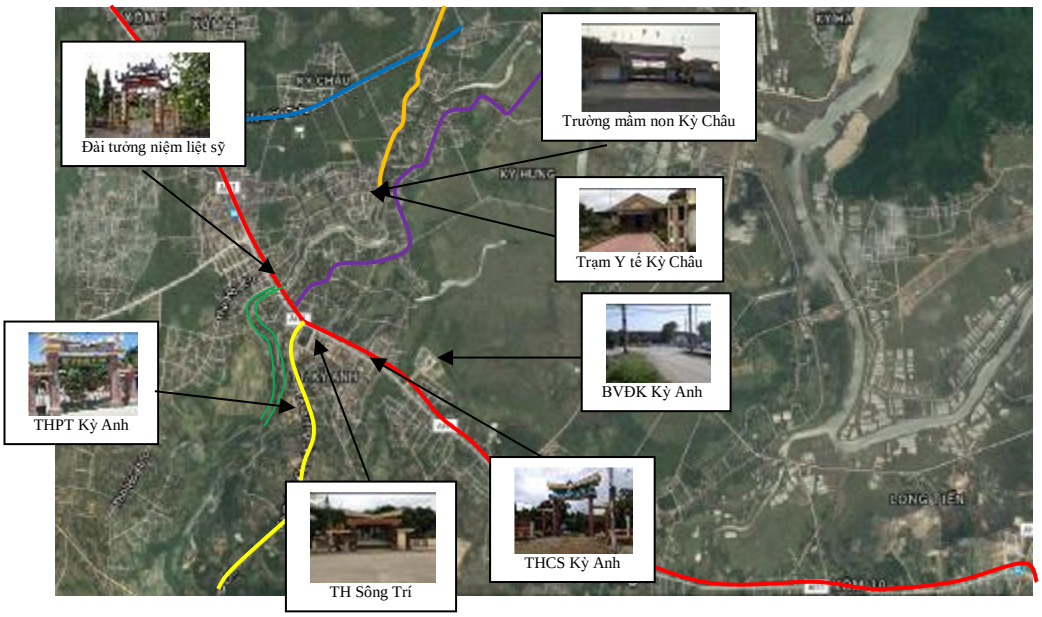


Figure 26: Sensitive Locations on the Route for Waste Transportation and Dumping

The impacts on urban view and landscape are temporary and assessed as medium level.

3.4.7. Increased Erosion and Landslide Risks

Erosion potentials, soil subsidence and landslide risks would be increased at deep cut and fills where slopes or deep holes are created and the walls may not be stable at some stages. Soil subsidence may also happen at or near relative shallow pipe trenches if there are existing weak structures nearby. Erosion potentials would also be high on barren disturbed ground, on relative high or unstable slopes due to the influences of wind and rainwater. Erosion rate would be accelerated by surface water runoff, particularly in cases where there is no proper drainage on the slope and on the foot. Erosion would make the slopes more unstable and result in landslide.

Relative steep slopes to be formed during the construction of the Project includes:

- Slopes on the shoulders of the main road, some sections new road surface would be 3m higher than the existing ground level;

- Excavated embankments at the Thuy Son lake and the Tri river, embankments could be 4.1 – 4.6 m high.
- The slopes formed after ground levelling to designed level at the WWTP, slopes on the edge of the lagoons within the WWTP, the holes created during the construction of the foundations of the administration building. The height of these slopes ranges from 1 to 3 m
- Trenches for installation of relative large sized sewers could be 0.8 - 1 m.
- Pump chambers at the pumping stations, 6-10 m.


Figure 27: Some Old Houses in The Project Area

These slopes are subjected to erosion and landslide risks. Erosion and landslides risks is highest at highest slopes/deeper holes, i.e. the pumping stations, the WWTP, Thuy Son lake and Tri river embankment. Landslide and soil subsidence risks would also be high where excavation takes place to close to existing heavy or weak structure as the old houses. Landslides and soil subsidence would cause threats to the safety of the workers, traffic means on the roads, and communities. Farmland may also be buried if landslide happens. Taking into account the information provided in Chapter 2, geological conditions in the area with moderate strength, the landslide risks could be considered as medium level, manageable and require strict management measures.

3.4.8. Increased Flooding, Sedimentation Risks

As discussed in Chapter 2, currently Ky Anh Town does not have a complete drainage system. Rainfall mainly flows the terrain which slopes from southwest to northeast to existing ditches, then to the streams, rivers and lakes, and finally to the sea. In consultation with the community, people also reported that waterlogging often occurs in the area near the WWTP.

Large volumes of construction materials and solid wastes generated during construction phase may cause blockage of the limited existing drains and/or drainage canals, leading to localised flooding. Localised flooding, if any, are most likely occurred at the areas surrounding the temporary loading of construction materials or the waste disposal site where existing drains are blocked or natural drains are disturbed. Localised flooding may also happen at and surrounding the construction site of secondary and tertiary sewers. Heavy rains may also take along solid waste and construction waste into existing drains causing blockage.

Backfilling of the road (up to 3.5 m above the existing ground elevation) may block existing drains causing local flooding along the road and pulses. around the treatment station if appropriate management measures are not taken.

On the other hand, the current status of the construction site of the wastewater treatment station is low land, rain water has been partly stored in the rice field before over flowing in to the surrounding area. Once the WWTP is levelled, rain water on the surface of the plant area will flow directly to the surrounding area, so water will concentrate faster to the existing ditch

nearby. This change will increase the risk of local flooding around the plant, the area already subjected to frequent local flooding may become more vulnerable to inundation.

Sedimentation in to the canals, rivers and lakes will also occur when waste and construction materials from the temporary storage area that are washed into the ditches, streams and lakes. In the dry season, the sediments enter rivers and streams mainly due to the influence of the slope topography and material pile gravity. In the rainy season, when surface runoff occurs, large amounts of waste and materials can be drained into rivers and streams if they are gathered near the shore without mitigation or management measures. The Tri river section where dredging and embankment lining take place, the Quyen and Cau Bau river sections where the bridges will be constructed are high risk locations for the material to be drifted causing river sedimentation.

The risks on flooding and sedimentation are assessed as medium and mitigable.

3.4.9. Traffic Disturbance and Increased Traffic Safety Risks

One of the main causes to traffic disturbance and increased traffic safety risks is from increased traffic density when trucks and other construction plants are mobilised to work in the project for transportation of construction materials and wastes. According to the estimation based on volume of materials, waste and truck loads, on average each day there will be 27 trips of 18T trucks going in and out of construction area at the Tri river canal, 8 trips along Thuy Son lake, 36 trips at the central road, 18 trips at the WWTP. With such number of trips, traffic on many roads in Ky Anh town will not be disturbed due to the current low traffic density except for NH1.

On the other hand, traffic disturbance and increased traffic safety risks would also be happened when the road surfaces are narrowed down during construction due to project vehicles parking at roadside temporary loading of materials and wastes, particularly bulky items such as sewer pipes on the road or at roadside, or the fences placed along the roads. Open trenches for pipe installation, placement of construction equipment, construction materials and wastes surround the construction sites, movement of trucks in and out of construction sites etc are the other causes of traffic disturbance and increased traffic safety risks. The current width of the road from 6-10m, during construction will be occupied about 1-2m. All HDPE pipe lines use rolling method so the road surface time is narrowed down to just a few days.

The roads affected the most by traffic disturbance and increased traffic safety risks during the construction phase would be along NH1A where box culverts (size 2m x 2m) would be constructed (with relatively long construction time). Traffic disturbance and increased traffic safety risks would also be significant in the area near the pumping stations located at roadside, the side roads on Tri river, the Ngan Ly road, DT10 road, 3/2 road on transportation route, Le Quang Chi road and around the Thuy Son lake. The riskiest locations are the intersections, those near Song Tri primary school's opposite to Thuy Son lake and the area nearby the Gas station of Company 474 at km564+900 on NH1 where often have multiple vehicles in and out.

The highest increase in traffic safety was in the morning (from 6.30-8h) and in the afternoon (from 4.30-6h) at the intersection between the road next to Tri River and NH1, the intersection between Nguyen Thi Bich Chau and NH1, Le Quang Chi road near Song Tri primary school and on NH1 where there are many business households and agencies in Ky Anh town center.

Table 48 below presents in detail the roads significantly impacted during the construction phase of the Project.

Table 48. Possibly Affected Roads during Construction Phase

No.	Impacted route	Description of impacts
1	National Highway No.1	This is the main transportation route of the city, with very heavy traffic, with lots of transportation. This route is planned for the transportation of construction materials and waste for disposal during the construction of all items. The impacts will be high on this thickly-populated area.
2	Provincial road 12a	This is the transportation route for the construction of the trunk road connecting urban centers. However, there will be few impacts as this street is relatively sparsely inhabited.
3	Nguyen Thi Bich Chau road	This is access roads to the construction site for transporting construction materials serving the construction of the work item of construction of the trunk road connecting urban centers. The impacts will be high on this thickly-populated area.
4	Le Quang Chi road	These routes are planned for the transportation of construction materials to the site for Tri river embankment and Thuy Son lake. Measures to secure safety and reduce noise during transportation are to be worked out as this area is dense-populated and there are 2 sensitive areas: Song Tri primary school and Bao An hotel.
5	The roads on two banks of Tri river	This is access roads to the construction site for Tri river embankment. The gathering of materials and increase of transportation vehicles and construction operation along this road may cause local traffic jams or accident at the intersections between the road and NH1.

Traffic disturbance and increase traffic safety risk would be most signification at the existing intersections and the intersections between the center road and existing roads such as Nguyen Thi Bich Chau, DT10, NH 1A, Ky Ninh- Ky Trinh and Le Quang Chi road. These are shown as red dots in the map below are marked roads, places with high risk of traffic safety during construction phase.

Figure 28: High Risk Location for Traffic Safety during Construction Phase

The impact level is assessed as medium can be minimized by appropriate traffic management measures.

3.4.10. Damages to Existing Infrastructure and or Disruptions to Related Services

Demolition activities, particularly relocation of existing infrastructure for site clearance, power connections for new pumping stations etc. may require power cut off for safety reason. It is expected that a total of 30 power poles and 1,200 m of power lines will be relocated upon site clearance. This power cut-off would disturb the lives of households or disrupt the businesses such as restaurants or catering places. This potential impact is not avoidable but can be mitigated.

At present, the water supply pipelines mainly run along the sidewalks of the streets. Excavation for the construction of sewers may cause damages to the existing water supply pipes in the area, interrupting water supply.

The existing electrical wires, internet cables or telephone lines hang may be damages by the operations of cranes and excavators as their hands/buckets may touch then damages the lines and poles, disrupting power supply and/or telecommunication services. Especially, there is an existing 22kV transformer station at the corner of Thuy Son Lake, so that the electricity poles, transformers and power lines connected to the station are at risk of damage during dredging and embankment.

During the construction and installation of drainage sewers, the road surface will be cut and roadbed will affect the traffic and underground technical infrastructure. According to RAP, a total of 38,766 m of existing roads will be cut for pipe installation.

The construction will affect the irrigation canal on agricultural land when the trunk road and the WWTP are built; Irrigation and drainage services in the area may be disrupted at some stages during the construction of the trunk roads and the WWTP. A total of 1,500 m ditches will be affected by the construction of the central urban road and the WWTP.

Deep excavation may cause soil subsidence then cracking of nearby structures. Strong vibration from road compactions may also cause damages to existing weak structures. such as the central urban road running through Ky Hung village, where many houses through the preliminary assessment found that built over 10 years, the structure is not stable and easy to be affected.

Figure 29: The Existing Houses in the Project Area

The impacts and risks of damaging existing infrastructure and disruptions of related services is assessed as medium can be minimized by appropriate management measures.

3.4.11. Impacts on Agricultural Production Activities

Agricultural land is mainly affected by construction activities in the area where the WWTP is built and along the trunk road.

Irrigation and drainage on agricultural land may be interrupted if existing canals are blocked or damaged, leading to reduced crop yields, sometimes resulting in crop failures. Carless unloading of construction materials and wastes may fill up some parts of agricultural land, burying the plant and may lead to reduced productivity.

Dust can affect the growth and development of crops leading to reduced yields;

The construction of the trunk road cutting through existing agricultural land may cause difficulties for the farmers to access to the field, particularly at sections where the new road is much higher than the existing rice field ground. The impacts would be highest when the farmers have to transport the seeds, fertilizers and other materials to the field or taking the harvested products home.

The impacts on agricultural production are short and assessed at medium.

3.4.12. Social Impacts

In addition to land acquisition and its related impacts, the project interventions will cause some other negative social impacts to communities and households not affected by land acquisition. These includes:

- Reducing incomes of road-side business households due to dusts and reduced accessibility
- Community disturbance due to construction impacts (increased dust, noise and traffic traffics, obstruct access etc.)
- Social impacts and issues related to influx of workers.

Reducing Incomes of Business Households. The main transportation roads as NH1, Nguyen Thi Bich Chau, Le Quang Chi are axial roads of town where there are many shops or small business households. During construction phase, part of the road may be occupied for construction activities, parking machineries or material loading. Such activities may cause or make the local people feel inconvenience to enter shops and road-side business, or customers may feel it is un-hygenic thus they done come to drinking/eating places in dusty area. With less customers, the incomes of these road-side business would be redued.

The application of rolled out construction method in the project would make social impacts on business households occur only in short time, intermittently and can be minimized.

Shops on Le Quang Tri road

Small business households on NH1 road

Figure 30: Shops and Small Business Households

Community Disturbance due to Construction Impacts. Roadside households would be disturbed by dusts, noise, vibration temporary reduced accessibility to their houses which are located along the road. These impacts may make the affected families change/modify their routine activities as studying (of children), cooking, eating and resting, entertainment, etc. On the other hand, traffic disturbance and increased traffic and safety risk or localized flooding

may affect travel habits of household members, particularly in temporary flooded/muddy areas. However, that impacts occur only in short, intermittent time and can be minimized if applied appropriate measures.

Social Impacts and Issues Related to Influx of Workers

Community Disturbance due to mobilisation of workers to the Project areas. It is estimated that the subproject will mobilize around 140 workers possibly comes from others localities to live and work in the Project area during construction phase which lasts two to three years. This number of workers compared to the population of each ward/commune in the region (from 1,529 to 10,834 people) is quite small. The workers may live in rented accomodation or in camps set up by the Contractors. Nevertheless, there will be some interactions betwween the workers at both construction areas and camps/rented accomodations with local community. Social disturbance or even conflicts may be arisen when the workers are presence in the project area due to the following reasons:

- The workers come from other places with different income, employment, reputation and expectations etc.
- Language used by the workers, their behaviours or ways of living not suitable to local culture/customs, particularly if they involve in drinking, gambling, sexual harassment or prostitution.
- Construction impacts, particularly waste and wastewater, cause nuisance, disturbance or even disruption to daily activities of local communities.
- Sanitation conditions at worker's living areas/camps is poor, causing environmental pollution which pose health risks for local communities.

In terms of *income level*, nearly 60% households in the subproject area have main income source from agricultural production and 16.7% households have income government salary. The popular income is 5 million dongs/month and there are big gaps between highest income (43 million dongs/HH/month) and the lowest income (VND 1 million /HH/month). The workers get paid for their works and the payments should be within the range between lowest and highest incomes of HHs in the community. Therefore, the arrival of the workers in the Project area does not show any significant differences in source or levels of income between the workers and local communities. Therefore, it is likely that no social conflicts between the workers and communities would be arisen due to differences in source or level of incomes.

With regards to ***language used*** *and workers' behaviours*, culture and customs, as there is no ethnic minority group living in the project area which is a city with economic and cultural exchanges with the surrounding area, so there should not be any significant cultural or custom differences between the workers and local communities. However, social conflicts may be an issue if the workers swear, use unsuitable slang languages. Social conflicts would be serious if the workers harass local women, or involve in drinking, gambling. Particularly, serious long-term health impacts if the workers involve in prostitutions as that would be the cause of STD, HIV/AIDs. In reality each construction company usually apply certain rules to manage the workers, prohibiting inappropriate behaviours and enforcing healthy lifestyles. Such regulations would be helpful for managing social impacts. However, current regulations may not be sufficient to manage all social risks/impacts and should be strengthened if a bidder wins the contract in the project.

Related to ***construction impacts***, the areas that are highly disturbed by construction activity are mainly located on agricultural land at some distance from existing residential cluster. The central areas of Ky Anh Town which is adjacent to the existing roads are either intermittently affected (on the transport route) or only affected for a relatively short period of time (as rolling

measures will be applied), except for the area of Thuy Son lake. On the other hand, people in the project area have been informed and consulted about the project proposal and related impacts, they should also understand the benefits of the project thus it is likely that local people would be able to sympathy and accept the temporary negative construction impacts. Therefore, social conflicts due to construction impacts should be small.

Additionally, local authorities in the project area have regulations on the temporary residence, temporary residence for the management of residents and temporary residents in the area. This will contribute to maintaining social security in the project area.

With regards to ***camp conditions***, it is likely that some contractors may set up camps for the workers to live in during construction phase, the others could rent houses of local residents to provide accommodation for the workers. In both cases, if localised pollution is caused from the workers' accommodations, nuisance and health impacts on to the nearby households would lead to social conflicts.

It is noticeable that Vietnam Labour Code (article 165) regulates that employers are prohibited to use people under 18 years of age to carry heavy objects, work at construction sites, to carry out works for demolition of structures, or work under water. Therefore, the age of workers hired by the contractors should be monitored during construction phase of the Project to ensure with this regulation.

Generally, the potential social impacts and risks of the subproject would be at low to moderate and manageable by the measures presented in Chapter 5.

3.4.13. Impacts on Cultural, Historical Resources

In the project area there are existing family worshipping houses, ancient wells mostly located in the distance of 0-500 from construction sites. Alignment analysis of the central road considered several options, one option would affect one family worshipping house and the other options would affect two to three family worshipping houses. Option with least impacs on family worshipping house was selected, the Nguyen Ca family worshipping house will need to be relocated. The house is a two-storey building with area of 40 m^2 constructed in 2008. There are altars for worshiping ancestors of the family among total 04 families. Worshiping activities are usually organized on the first and full moon of lunar months and anniversary day with maximum 50 attendees. Consultation with the Nguyen Ca recored that they supported the project and agree to relocate the worshipping house provided that adequate compensation and supports are received.

Figure 31: Nguyen Ca Family Worshipping House

There are several other a family worshipping houses and ancient wells located from 3 to 30m from the construction sites. These would be affected by construction impacts such as dust, noise, vibration, reduced accessibility etc.. The cultural and religious structure potentially affected by construction impacts are listed in the Table 49 below.

Table 49: List of Sensitive Works in The Project Area

No	Name/picture	Work Item	Distance to construction site (m)	Impacts/Risks
1	Nguyen Family worshipping house 	Tri river embankment in Ky Hoa commune. This area has low traffic density	30 m	- Hindear access to the Temple; - Increase in dust and exhaust gases, affecting visitors to the Ancestral worshipping house; - wastes, wastewater may cause nuisance to the public; - Risks of traffic accidents and community safety due to construction; and - Localized flooding because of construction during rainy days; - Conflicts between workers and local people to the Temple if the workers use inappropriate language or litter in the area - affect the religious activities that occur in the temple on the 1st, 15th lunar month and during the holidays, Tet - Impact on aesthetical
2	Nguyen temple 	Urban central road	30 m	
3	Vu Family worshipping house 	Urban central road	30 m	
4	Nguyen Family worshipping house 	Urban central road	40 m	
5	Nguyen Family worshipping house 	Urban central road	30 m	
6	Nguyen Family worshipping house 	Urban central road in Ky Hung commune	5 m	
7	Le Family worshipping house	WWTP in Ky Hung commune.	5m from the main pipeline	

				
8	Ancient well in Hieu Chau hamlet 	Urban central road	30m	- Negative impacts on aesthetical values if materials and wastes are loaded nearby - Construction machine operations can cause cracking in the well
9	Ancient well 	WWTP in Ky Hung commune.	3m from the main pipeline	

3.4.14. Community Health and Safety Risks

Construction activities may pose will be some health and safety risks for the local communities as discussed below:

- Site clearance can pose some accident risk to local people as well as the workers due to falling pieces of materials, electrical shocks etc.
- Construction activities with open holes and slopes created, construction plants and vehicle operations, loading and unloading of construction materials and wastes, usage of electricity and gases, welding activity etc. all pose safety risks to local residents if the present at or near construction areas.
- Increased vehicle traffic on existing roads, emissions, dust, and noise from construction activities will also cause health and safety risks to the local people.
- If camp is not managed well, waste and stagnant wastewater will cause pollution to the surrounding environment and affect public health.

Accident risk is highest at night and during peak traffic, in populated areas and areas near schools. Major transport routes such as NH1, Nguyen Thi Bich Chau and Le Quang Chi have higher potential risks for the health and safety of local people. The elderly, children and pregnant women are at the highest risk for health and safety during construction.

Therefore, these potential impacts and risks are at small to moderate level and can be mitigated.

3.4.15. Health and Safety of Workers

Potential risks during construction phase might be accident, fire and explosion. Accident risks are often related to deep excavated areas, high piles of materials and waste, operation of machinery and trucks, loading of bulky materials like sewer pipes, etc. Fire and explosion risks are often generated from the transportation and storage of fuel, explosives, power lines or electricity consumption.

Worker health will be affected by noise, dust and emissions from materials, waste and

machinery.

> *Health effects of dust and emissions:*
>
> Dust particles greater than 10 µm, if contact with eyes will potentially cause eye injuries, infections and allergies. Dust particles smaller than 5µm can penetrate into the lung and cause respiratory diseases such as: Asthma, pneumonia, long-term exposure to dust will lead to dust deposition and accumulation which is root of pulmonary fibrosis; NO_2 penetrates into lung through respiratory tract and absorb into lung membranes. Long-term and high exposure to NO_2 can cause to pneumonia.
>
> *Negative effects of Noise:* Noise can cause damages to parts of human body. First is the auditory sensory organ. It is directly affected by noises thereby decreasing sensory level of ears, declining hearing ability and causing occupational deafness. In addition, noises are causes of headaches, tinnitus, dizziness, nausea, neurological disorders, cardiovascular disorders and diseases related to the digestive system. Particularly for construction workers as during their work they are exposed continuously to noise and therefore will feel fatigue, hearing decline, distracted during labor process which can cause labor accidents.

The direct contact with cement, exposure to toxic substances such as cement, petroleum, construction additives can lead to skin corrosion or body absorption through the skin. The storage/use of fuel at camps is potential risks to fire, explosion, electrical shock, affecting significantly worker health and safety. Safety risks are also from the operations and functions of machinery, excavation works and slopes under construction.

Construction workers stay in camps will be at risks of being sick if they do not have access to clean water supply, drainage, and adequate housing facilities during their stay in the project area. Health risk may also be arisen from inadequate protection for workers from very hot weather in summer or cold weather in winter. The workers may also be may be infected with infectious diseases which are common in the project area such as dengue, malaria, eye diseases, and gastrointestinal diseases, etc.

Insects, poisonous creatures like snakes, poisonous spiders, Anopheles mosquitoes, Culet could appear in construction sites (particularly in bush land at the Tri river bank) or camp areas, they can bite/attack and cause injuries to the workers.

Noticeably, as noted in Chapter 2, there are number of HIV/AIDS positive cases in Ky Anh. Although local authority has been working on HIV/AIDS prevention and control, if the workers involved in social evils such as prostitution or drug addicts, they may be at risks of being contracted to HIV/AIDS or STD (sexually transmitted diseases).

Some workers will work at bridge construction sites or river dredging. They are at risks of falling into the water and drowned. The risks are high during bad weathers such as strong wind, strong waves or heavy rains.

Long term health of a workers may also be affected if they are exposed to pollutants, in contact with toxic/hazardous materials during dredging, excavation, carrying out welding activities., etc. This risk is manageable.

Fire and Fuel Leakage risks

Fire and explosion may occur during the transportation, handling and storage of fuel or gases, or due to the unsafe temporary ectricity supply system. Fire may also be caused by welding. Fire and explosion may cause loss of life and damage to property during construction.

These potential impacts on health and safety of workers are at small to moderate level and can be mitigated.

3.5.Site-Specific Impacts

a. Specific Impacts during the Rehabilitation of Thuy Son Lake

Dry season

Rainy season

Figure 32: Thuy Son Lake

As noted in Chapter 2, the Thuy Son lake has been heavily sediment, there is only stagnant water in dry season when dredging would take place. The rehabilitation of Thuy Son lake will generate 28,500 m^3 of excavated and dredged materials. This volume of materials will occupy certain land areas for both temporary loading and permanent disposal. The impacts related to disposal sites are discussed at the end of this section.

There are some shops, a school, a hotel and a small existing 22Kv power station poles and lines, and four roads surrounding the lake. Therefore, the typical construction impacts and risks at Thuy Son lake include:

- Bad odor released from dredged/ excavated materials;
- Increased dust levels from granual temporary loaded materials;
- Disturbance to the businesses of the hotel and shops near the lake
- Increased safety and traffic safety risks, particularly in the section near the school;
- Traffics disturbance and increased traffic safety risk due to dropping of material from trucks;
- Safety risks for local residents, school children, hotel guests and the workers;
- Nuisance for the public;

- Negative impacts on urban landscape from temporary material and waste loads;
- Operations of construction plants may cause damage to the power station and lines.

The site-specific impacts and risks at the Thuy Son lake are illustrated in the Table 50 below.

Table 50: Specific Impacts during the Rehabilication of Thuy Son Lake

Picture on Current Status	Notable Characters	Site-specific Impacts and Risks
	The Thuy Son lake has been heavily sediment, there is only stagnant water in dry season when dredging would take place. The rehabilitation of Thuy Son lake will generate 28,500 m3 of excavated and dredged materials. This volume of materials will occupy certain land areas for both temporary loading and permanent disposal. There are some shops, a school, a hotel and a small existing 22Kv power station poles and lines, and four roads surrounding the lake.	- Traffics disturbance and increased traffic safety risk due to dropping of material from trucks; - Bad odor released from dredged/ excavated materials; - Increased dust levels from granular temporary loaded materials; - Disturbance to the businesses of the hotel and shops near the lake - Increased safety and traffic safety risks, particularly in the section near the school; - Safety risks for local residents, school children, hotel guests and the workers; - Nuisance for the public; - Negative impacts on urban landscape from temporary material and waste loads;
 Within the lake area	- The bottom of the lake is heavily sediment, the volume of material dredge relatively large - The lake is dry in dry season, only stagnant water - There are four roads surrounding the lake	- Injury risk for worker when carrying out manual work on the bottom of the lake (insect bites, walked on broken materials etc.) - Some insects, reptiles may be disturbed or killed - Safety risks for local residents, school children if they enter excavation area;

Picture on Current Status	Notable Characters	Site-specific Impacts and Risks
  **Song Tri primary school**	- Song Tri primary school facing the lake on Le Quang Chi road	- Noise from the truck, car horn distracts teaching and learning activities - Increased traffic safety risks during school opening and closing hours - Accident risk for students if entering the construction area - Odor and dust from dredged material. - Negative impact on landscape.
 **Bao An hotel**	Bao An Hotel on Le Quang Chi Street. There are existing electrical pole and wires along the road perpendicular to the hotel. 30m from lake	- Nuisance to hotel guests - Negative impacts on urban landscape related to temporary materials and waste dumps - Dust from granular materials - Obstruct the hotel guest's walk - Increased traffic safety risks - Electrical poles and wires may be damaged, power supply service may be disrupted.
A road in front of Bao An hotel 	A road in front of Bao An hotel with sidewalk, power pole and wire, some trees	
	- There is a 22Kv power station at the intersection of Le Quang Chi and NH1	- Worker safety risk related to this station. - Increased traffic safety risks - Construction machines such as excavators, bulldozers may cause damage to the power station and lines
	- This is the intersection between NH 1A and Le Quang Chi road. There is some power poles and wires at this section.	

b. Site-specific Impacts during Lining of Tri River Embankment

Figure 33: Location of The Embankment Section

Dredging 1.5km of Tri river embankment will generate 4,762 m^3 of excavate soil and dredged materials. As discussed in Chapter 2, the contents of heavy metals in the excavated materials/sludge does not exceed standards thus the waste is considered as non-hazardous wastes. This volume of dredged/excavated materials requires a certain area of land for temporary storage and disposal. Impacts related to disposal sites are presented at the end of this section.

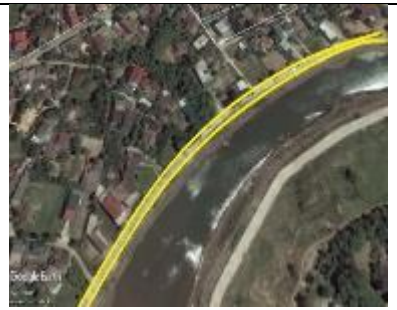
Typical impacts / risks of the Tri River embankment include:

- Some bush and trees will be removed or cutdown, reducing existing landscape at the riverside areas
- Injury risks for the workers such as drown in the river, or bitten by insects such as bees, ants, snakes from the bush in riverside
- Wastewater generated from dredged material
- Impact on water quality, aquatic life when mud is disturbed
- Reduced drainage capacity when the river bed is narrowed for dredging
- Reduced irrigation capacity when the river bed is narrowed
- Reduced access to water surface by local people
- Access to some houses and shops will be obstructed
- Risk of erosion, land slide on the two sides of the river during excavation

In some specific locations there may be some specific effects as shown below.

Table 51: Site-specific Impacts of Tri River Embankment

Location	Picture on Current Status	Notable Characters	Site-specific Impacts and Risks
Left bank		- The river banks have not had solid embankment or embankment with low crest (from +2.5m to +3.0m) so the dam discharge with huge water amount exceeding the river capacity, causing local flooding on both sides of the river (many of which are flooded from 0.5m to 1.0m)	
	 **Km0+000 to Km0+500**  **Km0+000 to Km0+500**	Start point - Currently the embankment side is covered with grass and shrubs. - There is no residential houses in this area. - There is the existing ditch in this section.	Start point - Loss of vegetation cover and some trees - Risk of accidents for workers caused by insects such as ants, bees, spiders, snake bites when building near the bush - Irrigation service may be disrupted if the ditch is blocked.

Location	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks
	 **Km0+500**	 **Km0+500**	Km0+500 - Most of the vegetation covered with shrubs. There are some trees. - This area is away from residential areas.	- Drowning accident risk.
	 **From Km0+500 to Km1+085**	 **From Km0+500 to Km1+085**	Km1+085 - The land being used for short-term crops (permanently acquired before construction) and vacant bush land. - This area is away from residential areas.	Km1+085 - Over clearance of existing vegetation cover. - Risk of accidents for workers caused by insects such as ants, bees, spiders, snake bites when building near the bush
	 **From Km1+085 to Km1+200**	 **From Km1+085 to Km1+200**	Km1+200 - This section has existing embankments and concrete roads. People live scatterly along this section. The houses are about 5-10m from the road (about 15 houses and restaurants).	Km1+200 - Temporary loaded materials generate bad odor causing nuisance to the public, affecting landscape. - Wastewater generated from temporary loaded dredged material may cause localize flooding. - Reduced access to watersurface by local people

Location	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks
				- Materials and construction plants obstruct access to houses and shops at riverside, affect their incomes - Disturbance to daily life and movement of local people. - Increased safety traffic safety risk - Trees in front of houses may be damage by construction plants
	 **From Km1+200 to Km1+500**	 **From Km1+200 to Km1+500**	The end point is the intersection between the existing road along the Tri river and NH1. Next to the intersection is a shop and a notary office.	- Increased traffic safety risks at the intersection with NH1 when trucks moved from the riverside road (lower elevation) to the NH1 (higher elevation) with limited vision.
Right bank	 **From Km0+000 to Km0+650**	 **From Km0+000 to Km0+650**	Start point - This section is vacant land covered with grass. - The section is 1.5km long. There is no existing road but only earthen path to agricultural land. There are some bushes and tall trees as riverside - The nearest residential's house is 60m from the river bank.	Start point - Over clearance of vegetation cover - Risk of accidents for workers caused by insects such as ants, bees, spiders, snake bites when building near the bush or being drown in the river. - The accessibility to agricultural land on this existing path may be disturbed.

Location	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks
	 **Km0+650**	 **Km0+650**	Km0+650 There are shrubs and some 1.5m tall trees on riverside.	
	 **From Km0+650 to Km 1+100**	 **From Km0+650 to Km 1+100**	Km 1+100 - There are no roads and mainly agricultural land. The bank of the river is the shore, there are many shrubs and some tall trees.	Km 1+100 - Dredged materials and wastewater may pollute crop land - Irrigation ditch may be blocked. - Disturb agricultural production activities - Over clearance of vegetation cover - Risk of accidents for workers caused by insects such as ants, bees, spiders, snake bites when building near the bush or being drown in the river

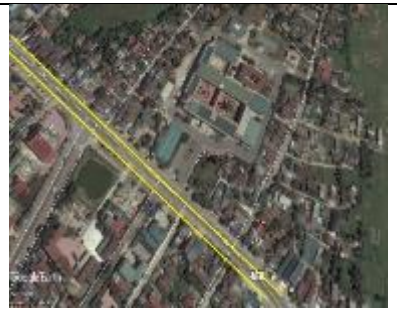
Location	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks
	 **From Km1+100 to Km 1+300**	 **From Km1+100 to Km 1+300**	Km 1+300 - This section has existing embankments and concrete roads. People live about 60 meters from the concrete road.	Km 1+200 - Temporary loaded materials generate bad odor causing nuisance to the public, affecting landscape. - Wastewater generated from temporary loaded dredged material may cause localize flooding. - Reduced access to watersurface by local people - Disturbance to daily life and movement of local people. - Increased traffic safety risk - Trees in front of houses may be damage by construction plants
	 **From Km1+300 to Km1+500**	 **From Km1+300 to Km1+500**	- The end point is the intersection between the existing road along the Tri river and NH1.	- Increased traffic safety risks at the intersection with NH1 when trucks moved from the riverside road to the NH 1A - Materials and construction plants obstruct access to houses and shops nearby the intersection, affect their incomes

c. <u>Specific Impacts Along The Main Pipeline, Pumping Stations and Wwtp</u>

Table 52: Site-specific along Main Pineline

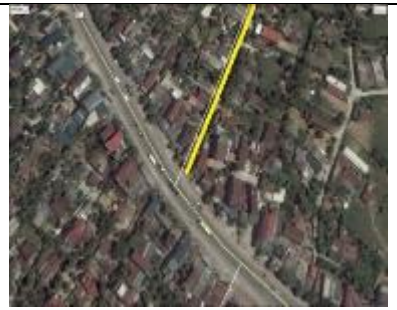
Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts/Risks
NH 1A	 **Start of the route, Km 0+000**	 **Start of the route, Km 0+000**	- Pipeline runs along the road, there is rainwater drainage system, population density is sparse, the distance from the house to the edge of the road is 5 - 10m. - Grass cover at roadside - there is an existing drainage, - population density is sparse	- Traffic safety risks at the intersection of the route - Disrupt access to roadside houses and shops for construction - Materials, construction waste may fall into and block the existing drainage ditches - The vegetation cover will be disturbed, partially removed
	 **Km 0+750**	 **Km 0+750**	- The pipeline built on siphon parallel to Ngay bridge. - There are some houses located 5-10m from the road edge.	- Increased traffic safety risks at the two ends of bridge - Dust, noise and disturbance to roadside houses - Obstruct access of households living along the road - Safety risks for workers when working at height and on water surface - Safety related to the use of electricity for welding.

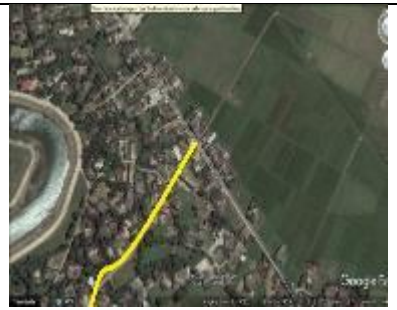
Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts/Risks
	 **Km 0+830**	  **Km 0+830**	- - Km 0+830: - The right-hand pipeline runs adjacent to the no name temple about 5m - There are power posts and wires on the roadside and crossing the road - There are green trees along the road 3-5m away from the sewer - There is a house 5-10m far from the sewer	- Impact on the landscape in front of the temple. - The power post and lines may be damaged by excavators / cranes - The trees may be damaged by excavators / cranes - Obstruct access to the houses, shops along the road - Dust, noise and safety risks to roadside houses
	 **Km 1+930**	 **Km 1+930**	- The pipeline passes through sub-zone 4, Hung Thinh residential cluster in Song Tri ward. - The distance from the house to the edge of the road is 5 - 10m	- Increased traffic safety risks - Obstruct access to roadside houses - Dust, noise and safety risks to the residents in roadside houses -

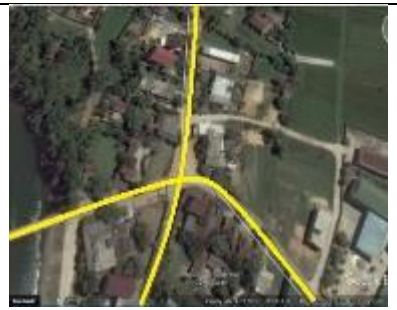
Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts/Risks
	 **Km 3+290**	 **Km 3+290**	- - Km 3+290: The pipeline passes through sub-zone 2, Hung Hoa residential cluster in Song Tri ward. The distance from the house to the edge of the road is 5 - 10m. This section is quite populated. - Electrical running above along footpaths at both sides	- Impacts on urban landscape related to temporary loading of waste and bulky materials - Disruption or damage to existing facilities such as water pipes, power and telecommunication cables, etc. - Disturb, interrupt the business of roadside shops - Damages to roadside electrical trees, wires and poles.
	 **Km3+650**	 **Km3+650**	- Km 3+650: the right-hand pipeline passes through Ky Anh General Hospital about 0-5m. - Trees, electrical poles and wires at roadside.	- Safety risks for the patients and doctors when present near the gate of the hospital particularly at night time, rush hours, during the handling of bulky items such as pre-casted pipes - Dust and noise disturb, affect the patients in the hospital - Damages to roadside electrical wires, poles and trees

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts/Risks
	 **Km4+050**	 **Km4+050**	- Km 4+050: Although not passing, the pipeline is 50m from Song Tri Primary School. - Electrical wires hang over head.	- Traffic disturbance and increased traffic safety risks affecting students - Accident risks for students relate to open trenches - Damages to electrical wires and poles. - Dust and noise affect - Roadside trees may be damaged
	 **Km4+710**	 **Km4+710**	- Km 4+710: The pipeline built on siphon parallel to Tri bridge.	- Increased traffic safety risks at the two ends of bridge - Dust, noise and disturbance to roadside houses - Obstruct access of households living along the road - Safety risks for workers when working at height and on water surface - Safety related to the use of electricity for welding.

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts/Risks
	 **Km4+890**	 **Km4+890**	- Km 4+890: The right-hand pipeline passes the memorial (7 m from the road) martyr of Song Tri ward. - Some trees on the footpath - Houses close to the road - Electrical wires along the road	- Traffic disturbance or interruptions - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Impacts on landscape in the area near the memorial - Trees may be affected or damaged - Electrical wires and poles may be damaged
	 **Km5+550**	 **Km5+550**	- Km 5+550: the pipeline passes through Viet-Lao 3-way intersection. - Electrical wires along the road	- Traffic disturbance or interruptions, increased traffic safety risks. - Urban landscape related to temporary loading of waste and bulky materials. - Trees may be affected or damaged. - Electrical wires and poles may be damaged
	 **End of the route (km 6+00)**	 **End of the route (km 6+00)**	- - Km 6+00: At the end of the collection pipeline along NH1A, at Ky Anh town post office. - Electrical wires along the road. - There are some trees at roadside.	- Traffic disturbance or interruptions - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shop - Electrical wires and poles may be damaged - Trees may be affected or damaged

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts/Risks
Ky Hung communal main road	 **Km 0+000**	 **Km 0+000**	- Pipeline characteristics: The pipeline runs along the main road of Ky Hung commune, some sections have rainwater drainage sewers, the population density is moderate, the distance from the house to the edge of the road is 0 - 5m. - There are some trees, electrical poles and wires at roadside	- Traffic disturbance or interruptions - Impacts on Urban landscape related to temporary loading of waste and bulky materials - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Trees may be affected or damaged - Electrical wires and poles may be damaged
	 **Km 0+760**	 **Km 0+760**	- Km 0+760: The pipeline runs along the main road of Tan Ha hamlet in Ky Hung commune, some sections have rainwater drainage sewers, the population density is moderate, the distance from the house to the edge of the road is 0 - 5m. - There are some trees, electrical poles and wires at roadside	- Traffic disturbance or interruptions - Impacts on Urban landscape related to temporary loading of waste and bulky materials - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Trees may be affected or damaged - Electrical wires and poles may be damaged

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts/Risks
	 **Km 1+000**	 **Km 1+000**	- Km 1+000: The pipeline runs along the main road of Tan Ha hamlet in Ky Hung commune, some sections have rainwater drainage sewers, the population density is moderate, the distance from the house to the edge of the road is 0 - 5m. - There are some trees, electrical poles and wires at roadside	
	 **Km 1+300**	 **Km 1+300**	- Km 1+300: The pipeline runs along the main road of Hung Hoa residential group, some sections have rainwater drainage sewers, the population density is moderate, the distance from the house to the edge of the road is 0 - 5m. - There are some trees, electrical poles and wires at roadside.	

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts/Risks
	 **Km1+560**	 **Km1+560**	- Km 1+560: The right-hand pipeline passes the memorial (7 m from the construction site) martyr of Ky Hung Commune Medical Center. - There are some trees, electrical poles and wires at roadside	- Traffic disturbance or interruptions - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Impacts on landscape in the area near the memorial - Trees may be affected or damaged - Electrical wires and poles may be damaged
	 **Km 1+670**	 **Km 1+670**	- Km 1+670: the pipeline passes in front of Ky Hung commune preschool.	- Increased traffic safety risks - Affect the movement of students and affect children's health and beauty of school building - Noise distract teaching activities and disturb sleep at lunch time
	 **Km1+770**	 **Km 1+770**	- Km 1+770: the pipeline passes Ky Hung commune ancient well. - 3 m from the road	- Increased traffic safety risks - Impacts of landscape values - Deep dredging can cause a risk of land slippage or well cracks

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts/Risks
	 **Km2+050**	 **Km2+050**	- Km 2+050: The pipeline runs along the main road of DT12 road, some sections have rainwater drainage sewers, the population density is moderate, the distance from the house to the edge of the road is 0 - 5m. - There are some trees, electrical poles and wires at roadside.	- Traffic disturbance or interruptions - Impacts on Urban landscape related to temporary loading of waste and bulky materials - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Trees may be affected or damaged - Electrical wires and poles may be damaged
	 **Km2+530**	 **Km2+530**	- Km 2+530: The pipeline runs along the main road of Tran Phu hamlet, some sections have rainwater drainage sewers, the population density is moderate, the distance from the house to the edge of the road is 0 - 5m. - There are some trees, electrical poles and wires at roadside.	

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts/Risks
	 **Km2+960**	 **Km2+960**	- Km 2+960: The pipeline passes through Hung Phu hamlet, the land around is vacant land.	- Urban landscape related to temporary loading of waste and bulky materials - Increased safety risks at the road curve
	 **Km3+300**	 **Km3+300**	- - Km 3+300: The pipeline runs along the main road of Hung Phu hamlet, some sections have rainwater drainage sewers, the population density is moderate, the distance from the house to the edge of the road is 0 - 5m. - There are some trees, electrical poles and wires at roadside.	- Traffic disturbance or interruptions - Impacts on Urban landscape related to temporary loading of waste and bulky materials - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Trees may be affected or damaged - Electrical wires and poles may be damaged

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts/Risks
Concrete road in Hung Hoa residential group connecting with Ky Hung communal main road	 **Km 0+000**	 **Km 0+000**	- -Pipeline characteristics: The pipeline runs along Hung Hoa residential area connecting the main road of Ky Hung commune, some sections have rainwater drainage sewers, the population density is moderate, the distance from the houses to the road edge is 0 - 5m. - There are some trees, electrical poles and wires at roadside.	- Traffic disturbance or interruptions - Impacts on Urban landscape related to temporary loading of waste and bulky materials - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Trees may be affected or damaged - Electrical wires and poles may be damaged
	 **Km0+ 400**	 **Km0+ 400**	- Km 0+400: the pipeline runs along the concrete road in Ky Hung commune, some sections have rainwater drainage sewers, population density is moderate, the distance from the houses to the road edge is 0 - 5m. - There are some trees, electrical poles and wires at roadside	-

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts/Risks
	 **Km0+680**	 **Km0+680**	- - Km 0+680: the pipeline passes in front of Ky Hung commune primary school	- Increased traffic safety risks - Affect the movement of students dust affect children's health and beauty of school building - Noise distract teaching activities and disturb sleep at lunch time
	 **Km0+930**	 **Km0+930**	- - Km 0+930: Connect with the pipeline of the trunk road in Ky Hung commune. - The nearest resident's house is 1 - 3m from the road edge. -	- Traffic disturbance or interruptions - Impacts on Urban landscape related to temporary loading of waste and bulky materials - Disruption or damage to existing underground facilities (water pipes) - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Trees may be affected or damaged - Electrical wires and poles may be damaged

Table 53: Site-Specific Impacts of Pumping Stations

PS	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks
Station 1: NH 1A, near Ky Anh town post office			- PS1 is on vacant land on the sidewalk of an existing two-laned, 8-10m wide asphalt road. - The area is densely populated with many shops and offices - Excavation depth: 4.6 m	- Risks of landslides and subsidence. - Increase traffic accidents risk. - Safety risk for local community. - Disturbed local's business as access is obstructed; - Affecting drainage capability - Dust, waste, negative impact on landscape. - Damage to trees, electrical poles and wires. - Soil subsident risks at the wall of pump chamber
Station 2: NH 1A, near the Ky Anh Market.			- PS2 is on vacant land on the sidewalk nearby Ky Anh Market, 8-10m wide asphalt road. - The area is densely populated with many shops and offices - Excavation depth: 3.1 m	- Risks of landslides and subsidence. - Increase traffic accidents risk. - Safety risk for local community. - Disturbed local's business as access is obstructed; - Affecting drainage capability - Dust, waste, negative impact on landscape. - Damage to electrical poles and wires. - Soil subsident risks at the wall of pump chamber
Station 3: NH 1A, near Vincom mall			- PS3 is on vacant land on the sidewalk nearby Vincom Mall construction site, 8-10m wide asphalt road. - The area is Vincom Mall construction site - Excavation depth: 6.7m	- Risks of landslides and subsidence. - Increase traffic accidents risk. - Affecting drainage capability - Dust, waste, negative impact on landscape. - Damage to electrical poles and wires. - Soil subsident risks at the wall of pump chamber

PS	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks
Station 4: Km4+011 NH 1A, opposite Thuy Son lake			- PS4 is on vacant land on the sidewalk opposite Thuy Son lake, 8-10m wide asphalt road. - The area is densely populated with many shops and offices - Excavation depth: 3.6m	- Risks of landslides and subsidence. - Increase traffic accidents risk. - Safety risk for local community. - Disturbed local's business as access is obstructed; - Affecting drainage capability - Dust, waste, negative impact on landscape. - Damage to trees, electrical poles and wires. - Soil subsident risks at the wall of pump chamber
Station 5: Km 3+110, on NH 1A..			- PS5 is on vacant land on the sidewalk nearby Hanh Phong grocery store, 8-10m wide asphalt road. - The area is densely populated with many shops and offices - Excavation depth:3.6 m	
Station 6: Km 2+750, on NH 1A.			- PS6 is on vacant land on the sidewalk nearby Viet Hai store, 8-10m wide asphalt road. - The area is densely populated with many shops and offices - Excavation depth: 4.9m	- Risks of landslides and subsidence. - Increase traffic accidents risk. - Safety risk for local community. - Disturbed local's business as access is obstructed; - Affecting drainage capability - Dust, waste, negative impact on landscape. - Damage to trees, electrical poles and wires. - Soil subsident risks at the wall of pump chamber
Station 7: Km1+655, on NH 1A			- PS7 is on vacant land on the sidewalk nearby Hoa Sua coffee shop, 8-10m wide asphalt road. - The area is densely populated with many shops and offices - Excavation depth: 2.7 m	

PS	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks
Station 8: Km1+000, on NH 1A.			- PS8 is on vacant land on the sidewalk, 70m from Ngay bridge, 8-10m wide asphalt road. - The area is sparsely populated. - Excavation depth: 5.3 m	- Risks of landslides and subsidence. - Increase traffic accidents risk. - Affecting drainage capability - Dust, waste, negative impact on landscape. - Damage to electrical poles and wires. - Soil subsident risks at the wall of pump chamber
Station 9: Km0+150, on NH 1A.			- PS9 is on vacant land on the sidewalk, near Thuy Hang hotel, 8-10m wide asphalt road. - The area is sparsely populated. - Excavation depth: 4 m	- Risks of landslides and subsidence. - Increase traffic accidents risk. - Safety risk for local community. - Disturbed local's business as access is obstructed; - Affecting drainage capability - Dust, waste, negative impact on landscape. - Damage to electrical poles and wires. - Soil subsident risks at the wall of pump chamber
Station 10: Ky Hung commune main road			- PS10 is on vacant land on the sidewalk at the intersection of internal road, 4-6m wide concrete road. - The area is densely populated with local houses - Excavation depth: 3.6 m	
Station 11: Ky Hung commune road, far from the treatment plant			- PS11 is on vacant land on the sidewalk, 4-6m wide concrete road. - Excavation depth: 7m	- Risks of landslides and subsidence. - Increase traffic accidents risk. - Dust, waste, negative impact on landscape. Soil subsident risks at the wall of pump chamber

Table 54: Site-specific Impacts of The WWTP

Location	Picture on Current Status	Notable Characters	Site-specific Impacts and Risks
Treatment plant	 	- The wastewater treatment plant is 80 m from the Tri River. Currently, land use at this site is agricultural land and aquaculture production. - There are some irrigation ditches on this agricultural land - Feedback from consultation meeting shows that the WWTP area is subject to flooding in rainy season - The nearest house is nearly 1km from the WWTP - The elevation of the WWTP is higher than the ground level of 3m	- Disrupt accessibility to agricultural land surrounding the WWTP - Construction materials and wastes may overflow onto the surrounding agricultural land causing damages to crop trees, affecting productivity - Irrigation ditches in agricultural land around the plant may be filled up and blocked - Surface runoff on elevated ground at the WWTP sites may disturb existing drainage pattern and cause more serious localized flooding - Surface runoff passing the WWTP may affect the the Tris quality of river - Social disturbance related to concentration of the works to the WWTP area - Environmental pollution due to waste and wastewater from camps - Safety risks for the workers during the construction of WWTP discharge structure - Safety risks for community
Access road to the plant D400 pipelines will be installed along this road	 	- The access road to the current treatment station is Ky Hung commune concrete road. The end of the route (500m) approaching the station is now the trail used by people for their agricultural and production purposes.	- Traffic disturbance or interruptions, particularly during seedling and harvesting - Dust on local roads due to materials from trucks dropping on the road - Soil subsidence, landslide risks due to deep excavation or on weak soil or excavation taking place too close to existing or structures - Impacts on landscape related to temporary loading of waste and bulky materials - Disruption or damage to existing underground facilities such as water pipes,

Location	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks
			Traffic density on this road is sparse. -	- Safety risks for the public and workers, particularly at night time during the loading/ unloading and operations related to bulky items such as pre-casted pipes - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops
Discharge area			- The discharge receiving area of the WWTP treatment station is located in the downstream of Tri River, and the receiving river section is 65m wide. There is aquaculture land located 1km downstream from the treatment plant which belongs to residents in Tran Phu village, Ky Hung commune. There is almost no fishing and navigation activities on this river section	- The main risk in the construction phase is construction materials, waste is washed into the river - Accident risk for the workers – falling into river and drowned - Accident risk for the community.

d. Site-specific Impacts along the Main Road Connecting Urban Centers

Site-specific impacts of new road construction is the embankment effect of the new road may disturb existing drainage pattern and cause localized flooding in the surrounding areas.

Figure 34: Layout on the Main Road Connecting Urban Centers

Table 55: Site-specific Impacts along The Main Road Connecting Urban Centers

Location	Picture of Current Status at noticeable locations	Notable Characters	Site-specific Impacts and Risks
Km0+000 ÷ 0+450		- The beginning point is connected to the road to Formosa Industrial Park, the existing road and a bridge that the proposed alignment cut through is no longer in use. - New bridges will be built at the site of the old bridge. - The current land use along the alignments are agricultural land. - Differences between existing ground elevation and road surface is from 0 – 1.8m	Elevated ground may disrupt/obstruct access of local people when moving from one to the other side of the road Drainage pattern may be disrupted
	 **Km 0+00**  **Km 0+450**	- Beginning and ending point, intersects with existing road.	- Increased traffic safety risks at the intersection with the existing road - Disrupt the existing irrigation canals in this area - Blockage of irrigation canals if soil is spreading the irrigation canal

Location	Picture of Current Status at noticeable locations	Notable Characters	Site-specific Impacts and Risks
	 **Km0+100**	- The existing bridge which is no longer in use will be demolished, new bridge will be built at this location - The nearest house is nearly 1 km from this bridge	- Sedimentation of stream due to granular materials - Stream water pollution due to construction and excaxated materials and bentonite may fall into the water - Safety and Drowning risks to the workers particularly when water level is high
Km 0+450 ÷ 2+610		- The beginning point is the intersection with the existing road to Ky Ninh beach. - The elevation of the road surface is higher than the ground level of 0.73 to 3.5m - The beginning and the end of the section are near the residential area. There are some houses scatterly located in these two areas - The alignment cut through agricultural land and some	- Cut through the existing rural power grid - Increased traffic safety risk at the intersections between the proposed road and other existing roads. - The section runs through agricultural land with annual crops. Separate agricultural land, particularly during the seedling and harvesting season - The road with elevated ground may disrupt/ obstruct access of local people when moving from one to the other side of the road - Drainage pattern may be disrupted

Location	Picture of Current Status at noticeable locations		Notable Characters	Site-specific Impacts and Risks
	 **Km 0+455**	 **Km 0+455**	existing roads, and a powerline - A new bridge will be constructed at Km 1+772	- Damages to existing power lines/poles - Noise, vibration, construction solid wastes, and wastewater may affect the houses nearby - Irrigation canals may be blocked due to soils and from construction sites - Construction materials and wastes fill up some areas in cultivating land. - Disturbance to seedling, cultivation and harvesting activities <u>New Bridge construction:</u> - Sedimentation of stream due to granular materials - Safety and drowning risks for workers when working at height and on water surface. - Stream water pollution due to bentonite from drilling and sedimentation from excavation.
	 **Km1+800**	 **Km2+610**		
Km 2+610 ÷ 3+390			- Population density is moderate. - This section cut through agricultural land and some roads including an existing rice field internal road at km2+610, intercommunal road at km3+000. - The elevation of the road surface is higher than the ground level of 0.71 to 2.93 m	- Risks of damage cause to power poles and wires. - Traffic disturbance and increased traffic safety risk at the intersections, particularly provincial road No. 12. - Disrupt irrigation canals in this area: blockage of irrigation canals, spreading of soils to the irrigation canal - Construction materials and wastes affecting the cultivating fields and arable agricultural land

Location	Picture of Current Status at noticeable locations		Notable Characters	Site-specific Impacts and Risks
			- There are existing power pole and lines near construction area. - A bridge crossing Tri River will be built at Km2 + 900.	- Noise, vibration, construction solid wastes, and wastewater may affect houses nearby - The road with elevated ground may disrupt/ obstruct access of local people when moving from one to the other side of the road - Drainage pattern may be disrupted
	 **Km2+610**	 **Km2+830**	- Road sections cut through residential land, agricultural land and internal roads in the commune. - House is located two sides along the route - The Ancestral worshipping houses in the area are located 30-100m from the site	- Noise, vibration, construction solid wastes, and wastewater may affect houses nearby - Disturbing traffic and daily activities of local people - May interrupt worshiping activities in the 1st and 15th days of each lunar month.
	 **Km2+900**	 **Km 3+00**	- Road sections cut through residential land, agricultural land and internal roads in the commune. - The area has many temple, sensitive works - House is located alternately along the route - The bridge will be constructed at Km 2+900. At present, the river has concrete embankment at this section. Bridge access road cut through garden land with	- Disturbing traffic and daily activities of local people - Noise, vibration, construction solid wastes, and wastewater may affect houses nearby <u>New Bridge construction:</u> - Stream water pollution due to bentonite from drilling and sedimentation from excavation. - Safety risks for workers when working at height and on water surface. - River sedimentation risk due to material and waste temporary loaded at the riverside.

Location	Picture of Current Status at noticeable locations	Notable Characters	Site-specific Impacts and Risks
		bamboo trees, pomelo, barring onia and bushes. The nearest house is 18 – 35m from the bridge.	- Over clearance of vegetation cover and trees at garden land
	 **Km3+390**	- Cut through concrete road and field - The house will be removed	- Disturbing traffic and agricultural production activities of local people
Km 3+390 ÷ 3+750		- The section is a rice field in Ky Chau commune. - The distance from the center line to the nearest house is 90m. The elevation of the road surface is higher than the ground level of 0 to 1.43 m	- Separate thus disrupt accessibility to agricultural land, particularly during seedling and harvesting seasons - Disturbing traffic and daily activities of local people - The road with elevated ground may disrupt/ obstruct access of local people when moving from one to the other side of the road - Drainage pattern may be disrupted

Location	Picture of Current Status at noticeable locations		Notable Characters	Site-specific Impacts and Risks
	 **Km 3+390**	 **Km 3+390**	- Cut through fields, irrigation canals and concrete roads -	- An existing road will be demolished - Irrigation canals may be blocked due to soils and from construction sites
	 **Km3+750**	 **Nguyen Thi Bich Chau road – End point**	- The end point is the intersection with Nguyen Thi Bich Chau	- Traffic disturbance and traffic safety at intersections with existing roads - Disturbance to agricultural cultivation activities

e. Site-specific Impacts along the Disposal Site

Figure 35: Location of Disposal Site

Figure 36: The Existing of Cup Coi Disposal Sites

The disposal site for construction material of the project is proposed at Cup Coi mountain in Ky Hung commune, within the Cup Coi borrow pit. At present the site is the exploited area of the borrow pit which requires backfilling. At present, the disposal site is the exploited area of Cup Coi quarry, which is 5-7m deep and area of 3ha. The disposal site will use internal path, drainage system and environmental protection measures which the quarry is applying. The site can get disposal of 1.5 million m3 of construction wastes and can be accessible by NH1A, Le Quang Chi and NH12C. This is a mine with pits that need to be levelled and restored. There is no residential area or sensitive works near the disposal site.

The potential social and environmental impacts related to disposal of the excavated materials include:

- Changes in ground elevation. The height of the dumps would be between 2 to 3 m. However, the existing ground elevation at the disposal sites are 1.5 to 2.5 m below ground elevation of the surrounding areas. Therefore, the final height of the dumps would be 0.5 to 1.5 m higher than the surrounds. Changes in ground elevation at the disposal site may disturb drainage pattern. As the disposal sites are currently lower than the surrounding ground, when being filled with materials, localized drainage pattern in the area will be changed, localized flooding may happen if alternative drains are not created. This potential impact is at moderate level and can be managed and mitigated by the construction and maintenance of ditches surrounding the foot of the disposal dumps.

f. Site-specific Impacts along the Worker Camp

Figure 37: Location of Worker Camp

Table 56: Site-specific Impacts of worker camp

Item	Location	Characteristic	Impacts
Tri river embankment and Thuy Son lake embankment	Left bank of Tri river, 500m from Tri river bridge	Vacant land near the embankment area, 100m from the nearest residential area There currently are some shrubs in the area 	- If there is no clean water for workers to use, it can affect health - There may be risks of over clearance to vegetation and vegetation cover - Snakes and reptiles can crawl into camps to bite workers - waste from the camp could affect camp' hygiene and health of workers - Waste and wastewater from camp may pollute Tri river water
Main central road	Km 0+000	Vacant land near the road to Formosa and inside the residential area. 	- Snakes and reptiles can crawl into camps to bite workers - Stagnant wastewater and waste from the camp could affect camp' hygiene and health of workers - Social conflict with local resident - Disrupt existing drainage at site
	Km 2+610	Vacant land, 50m from the residential area and Tri river 	- If there is no clean water for workers to use, it can affect health - Waste water, waste from the camps can pollute the surrounding agricultural land - Waste and wastewater from camp may pollute Tri river water - Social disturbance from interaction between the worker and community
Wastewater collection and treatment plant	At the WWTP site	Vacant land inside the treatment plant, 500m from the nearest area. 	- Waste water, waste from the camps can pollute the surrounding agricultural land and surface water in Tri river - If there is no clean water for workers to use, it can affect health

3.6. Impacts during Operation Phase

a. Thuy Son Lake

In addition to the positive impacts of the dredging of Thuy Son Lake, three main environmental and safety issues in the operation of Thuy Son Lake should be considered.

1. The lake is currently surrounded by green vegetation. After lining the embankment, this vegetation may no longer exist, be replaced with the built material on the embankment. Green spaces on the lake will be lost if embankment construction does not include green retention solutions
2. After embankment lining, the embankment will be steeper and harder, access to the lake watersurface may be moredifficult
3. After being dredged, the lake will be deeper and embankement will be steeper therefore if someone falls into the lake then the risk of dying from drowning will be higher.

The risk level of the issues mentioned above is low andcan be solved by technical solutions in the detailed design of the lake and is presented in Chapter 4.

b. Tri River Embankment

Traffic safety risks may be increased particularly at the junction between the new riverside road and NH1a. This risk can be addressed by proper design of the junction to control speed and provide adequate visions for drivers when approaching the junction.

The 15 households living along the embankment has existing ground elvation at 3.6-4.2m, the designed altitude of the embankment is 3.5m thus accessibility to these roadside households will be maintained after embankment lining is completed..

At present, there are some people who need to use river water for some purposes such as irrigation and house construction. Currently it is quite easy to access water surface from earthern embankment to get water. , When the embankment is lined with hard material and the levee becomes more steep, it will be difficult to get into the watersurface.

c. Construction of Trunk Road Connecting Urban Centers

During operation phase of the trunk roads, the following impacts and risks would need to be considered:

Increased Traffic Safety Risks. As the trunk road has three junctions with the existing roads, safety risks at road sections near these junctions will be increased during operation phase. Traffic safety risks during operation phase would be increased specifically at the following locations:

The intersection with the road to Formosa Industrial zone	The intersection with Nguyen Thi Bich Chau road	The intersections between the main road connecting urban centers and the existing local roads
		

Cause fragmentation of agricultural land. The trunk road passing mostly agricultural land thus it would cause fragmentation of agricultural land, separating residential areas from agricultural production areas. As the road surface is 3.5 m higher than existing ground elevation, the movement of people from houses or agricultural land from one side to the other side of the road will be difficult. Although it is a town, some households still keep their livestock. The elevation ground at the new road will also cause difficulties for cattle grazing or transportation of production materials between the two road sides become more difficult.

Disturb drainage. Main drainage direction is based on natural terrain, currently from southwest to northeast, from high to low, then flow into the local rivers and streams and then into the sea. The existing drainage capacity pattern will be altered when the new road also functions as an embankment crossing the area, local inundation may happen if longitudinal and crossing drains are not included adequately.

These potential impacts would be at medium to high level, and mitigable through design solutions and operational control methods.

d. Wastewater Collection and Treatment Plant

Impacts on Flow Rate

The design capacity of the WWTP is 2,000 m^3/d or equivalent to 0.02 m^3/s. The treated wastewater will be discharged to Tri river. The average flow rate in the Tri river in dry season is 7.3 m^3/s, it shows that at design capacity of 2,000 m^3/d, the proposed WWTP would add 0.3% into the flow of the Tri river in dry season, the potential impacts of the WWTP on the Tri river would be very small, negligible, thus will not be discussed further in this ESIA report.

Impacts on Water Quality of Receiving Water Body

The project would bring about the positive effect on the quality of the receiving water body when untreated wastewater is collected and treated to meet standard before being discharged into the Tri river. The volume of pollutants in treated wastewater at rate 2,000 m^3/day is indicated in Table below:

Table 57: Pollutants Treated by The Project

Parameter	Unit	Input	Output	Treatment	% Treatment
BOD_5	Ton/day	0.7	0.01	0.7	98
SS	Ton/day	0.5	0.2	0.4	68
Total N	Ton/day	0.1	0.09	0.03	25

Treated wastewater will meet QCVN 14:2008/BTNMT-Colum B before discharged into the Tri river.

To assess the impact of the wastewater onto the quality of water in Tri river in project area, IPC model introduced by the WB and WHO is applied. The WWTP discharge rate 2,000 m^3/day, the flow rate at the Tri river is 7,3 m^3/s (in dry season).

In practice, there are some water quality models that can be used such as: IPC, QUAL, QUAL2EU, QUAL2K, SWAT, BASIN … However, the application of QUAL, QUAL2EU, QUAL2K, SWAT, BASIN is complicated and requires a lot of input data, resources and time. Therefore, in the scope of this ESIA report, IPC model was used for rapid assessment based on dilution model.

$$C = (Q_n * C_n + Q_s * C_s) / (Q_n + Q_s)$$

In which:

- C is the content of pollutant forecasted.
- C_n is the content of pollutant of the exhausted source.
- C_s is the content of pollutant of the receiving source.
- Q_n is the current of the exhausted source.
- Q_s is the current of the receiving source.

Table 58: Forecasted Pollutant Concentration in Tri river in Operation Phase

No.	Pollution parameter	Cs	Qs	Q_n	C
Tri river					
1	Total nitrogen	0.58	741	0.02	0.58
3	BOD_5	16.2			16.2
5	SS	72.1			72.1

The figures in the Table 58 indicated that as the flow rate of the treated effluent from the WWTP is very small (0.02 m3/s) compared to the designed river flow rate (741 m3/s), the contribution of pollutants from the treated effluent of the WWTP does not cause any changes to the water quality of the receiving water quality.

Wastewater Quality at Outlet When System Failed

According to design, the capacity of the WWTP is 2,000 m^3/day with the following specific design parameters of the ponds:

- Anaerobic ponds: 1 anaerobic ponds, with a dimension of 19x46m; talus: 1:1, depth: 4.5 m; volume: 5,680 m^3; water retention time: 2.5 days;
- 02 Facultative ponds level 1: 2 facultative ponds, after anaerobic ponds; each with a dimension of 29x110 m; talus: 1:1, depth: 3.5 m; volume: 14,242 m^3; water retention time: 7.12 days;
- 02 Facultative ponds level 2: after 2 facultative ponds level 1; each with a dimension of 25x138 m; talus: 1:1, depth: 4 m; volume: 19,312 m^3; water retention time: 9.77 days;
- Disinfection tank: 01 disinfection tanks for stabilizing and disinfecting treated wastewater before discharging into Tri river; with a dimension of 6x6x4.3 m; water retention time of 0.01 days.

Therefore, the total water retention time after wastewater has passed through all the ponds to the discharge point of Tri river as calculated for the capacity of 2,000 m^3/day is:

Total water retention time (capacity of 2,000 m^3/day) = 2.5+7.12+9.77+0.01= 19.4 (days)

The result of the above calculations means that after being built, it still takes 19.4 days for a wastewater drop to travel from the intake of the WWTP to the outlet. During that travel time, parts of the contaminants in the wastewater will be decomposed. As the result, even if the treatment facilities of the WWTP failed, parts of the pollutants in the wastewater are still be removed before the flow reaches the outlet after up to 19.4 days since entry.

According to Kriton Curi, 1980, normally BOD is divided into 2 stages: (1) carbonaceous stage with a period of about 12 days; and (2) nitrogenous stage with a period from the 13th day to the 24th day. Therefore, for this WWTP, the decomposition process of carbon compounds has been basically completed after a retention time of 19.4 days in the system of ponds. The remaining pollutants in the wastewater for emergency discharge into Tri river only consists of organic nitrogen compounds.

In normal domestic wastewater, the content of carbonaceous BOD compounds account for about 70% of the total BOD content of wastewater. Thus, even in case where the WWTP encounters adverse incidents nearly 70% of the BOD content in wastewater would be removed

before the wastewater reaches the outlet of the WWTP. Meanwhile, the total nitrogen value will have a self-treatment efficiency of almost zero. According to design parameters of the WWTP, the BOD content in influent wastewater of the plant is about 350 mg/l O_2 (in the worst case) while the total nitrogen content of the influent wastewater of the plant is about 60 mg/l (in the worst case). In case the plant fails, these contents would not decrease significantly after a retention time of 19.4 days at the plant. On the contrary, the BOD content in wastewater is forecasted to decrease approximately by 70%, i.e. the remainder is about 105 mg/l O_2.

Therefore, when system failed, the effluent at the outlet would have BOD concentration at 105 mg/l O_2, total nitrogen and other pollutants would be the same as in untreated wastewater. The following calculations determine the quality of the Tri river after receiving the effluent from WWTP when treatment system fails.

Flooding risks at the WWTP

This risk has been considered carefully during the feasibility study stage. Hydrological survey data shows that the highest flood water level in the Tri River at the location of WWTP is 2.68m in 1993; 3.48m in 2007. The designed ground altitude at the WWTP is Z = 3.5 which is higher than both the 5% flooding frequency and the measured flood peak 3.48m in 2007. The desig layout of the WWTP included storm water drainage system, and the designed volume/water level in the biological pond contain volumes for rainwater falling into the pond from designed rainfall to prevent overflowing. Therefore, the risk of overflowing biological pond is likely not occur during operation phase of the WWTP.

Gas Emissions from WWTP

WWTP is source of biological gases that can disperse with the wind about some tens, hundreds of meters. Sol gas may contain bacteria and fungers that could be the cause of diseases or allergy through respiration. Such biological gases would affect air quality of surrounding the WWTP. For the Project's WWTP, the gases would be mostly generated from the balancing pond.

Table below provide indications of bacteria density near WWTP presented at the 7th International Conference on Environmental Science and Technology – Ermoupolis. Bioaerosol formation near sewage treatment facilities.

Table 59: Density of Bacteria in The Air at The WWTP

Group of bacteria	Value (CFU/m^3)	Average (CFU/m^3)
Total bacterium	0 – 1290	168
E. coli	0 – 240	24
Intestine bacterium and other species	0 – 1160	145
Fungus	0 – 60	16

CFU/m^3 = Colony Forming Units/m^3

The quantity of bacteria generating from the WWTP would be varied significantly in each location, highest at the WWTP and lowest in the far distance.

Table 60: The Quantity of Bacterium Dispersing from The Wastewater Treatment Plant

	Quantity of bacterium/1 m^3 air			
Distance	0 m	50 m	100 m	>500m
End of windy direction	100 – 650	50 – 200	5 - 10	-

	Quantity of bacterium/1 m^3 air			
Head of windy direction	100 – 650	10 – 20	-	-

Source: 7th International Conference on Environmental Science and Technology – Ermoupolis. Bioaerosol formation near sewage treatment facilities, 2001

Odor from WWTP and Pumping Station

Odor from WWTP and pumping stations generates mainly from the units where anaerobic disintegration takes place. Aerobic disintegration also generates odor but at low level. The gas generated mainly from anaerobic disintegration including H_2S, Mercaptan, CO_2, CH_4 etc in which, H_2S and Mercaptans as the main substances causing the odor, whereas CH_4 is the substance causing fire and explosion if accumulated at a fixed concentration.

Table 61: Odour-causing Compounds Containing Sulphur from Anaerobic Disintegration

Compounds	**Formula**	**Specific smell**	**Finding threshold (ppm)**
Allyl mercaptan	CH_2=CH-CH_2-SH	Garlic, strong coffee smell	0,00005
Amyl mercaptan	CH_3-$(CH_2)_3$-CH_2-SH	unwell, odor	0,0003
Benzyl mercaptan	$C_6H_5CH_2$-SH	Unwell, strong	0,00019
Crotyl mercaptan	CH_3-CH=CH-CH_2-SH	Fox smell	0,000029
Dimethyl sulfide	CH_3-S-CH_3	Decomposed plant	0,0001
Ethyl mercaptan	CH_3CH_2-SH	Decomposed cabbage	0,00019
Hydrogen sulfide	H_2S	Decomposed egg	0,00047
Methyl mercaptan	CH_3SH	Decomposed cabbage	0,0011
Propyl mercaptan	CH_3-CH_2-CH_2-SH	Unwell	0,000075
Sulfur dioxide	SO_2	Pungent, allergy	0,009
Tert-butyl Mercaptan	$(CH_3)_3$C-SH	Fox smell, unwell	0,00008
Thiophenol	C_6H_5SH	Odor, garlic smell	0,000062

Source: 7th International Conference on Environmental Science and Technology – Ermoupolis. Odor emission in a small wastewater treatment plant, 2001

There are basic difference between the compounds containing Sulphur in WWTP various treatment units. H_2S increases from two sources reduction of Sulfide (resistance [1] and [2]) and the DE Sulphur of the organics containing Sulphur (resistance [3]).

$$SO_4^{2-} + \text{organic} \xrightarrow{\text{Bacterium}} S^{2-} + H_2O + CO_2 \quad [1]$$

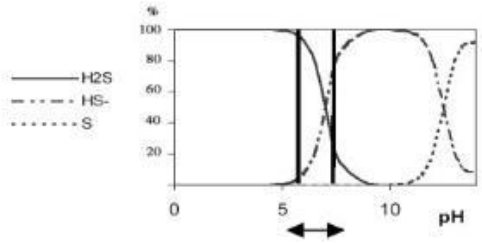
$$\longrightarrow S^{2-} + 2H^+ \longrightarrow H_2S \quad [2]$$

$$SHCH_2CH_2NH_2COOH + H_2O \longrightarrow CH_3COCOOH + NH_3 + H_2S \quad [3]$$

H_2S is easy to separate:

$$H_2S \xleftrightarrow{pH = 7,04} H^+ + HS^- \xleftrightarrow{pH =} H^+ + S^{2-} \quad [4]$$

The separation of H_2S:



Anaerobic disintegration generates the odor but at low level and negligible.

Table 62: H_2S Generated from WWTP

Units	Level (g/s)	The rate for generating into the air (%)
Interceptors	0,019	0,1380
Garbage screen	0,005	0,0427
Intake	0,113	1,0000
Aerobic pool	$6,08*10^{-27}$	0,1427
Sedimentation tank	$7,44*10^{-32}$	0,1928

Source: 7th International Conference on Environmental Science and Technology – Ermoupolis. Odor emission in a small wastewater treatment plant, 2001

Odor mainly generated from pumping chamber and the balancing pond but at low level. Besides that, the pump stations are contained thus odor would be minimal. As presented in Project Description, the WWTP design included or treatment unit to eliminate odor problem.

Waste Generation

Waste generated from workers can be calculated based on the maximum number of workers employed in the factory (estimated at 5 people). The amount of solid waste generated is estimated at 2.5 kg / day based on 0.5 kg / person / day and assumes that workers are allowed to eat at the site.

Some wastes would also be gathered daily from the grit chamber at the water intake.

With biological pond treatment technology, the ponds will need to be dredged after every several years of operations.

These wastes may cause nuisance, pollution and affect the workers' health. The waste and related risks during the operation of the WWTP and can be managed.

Environmental Hazard and System Failure Risk

Chemical Leakage

Chlorine will be used for wastewater treatment. Thus, there is a risk of chlorine leakage from containers or accidents from chemical handling. If serious chlorine leakage or accidents happen, it would cause the serious air, soil, and water pollution and health hazard to the operators and the public. The risk of the Chlorine leakage and accidents will be controlled by the measures presented in Chapter 5.

Other Risks and Issues

If sewers are broken or blocked, untreated wastewater would be leaked onto the ground and spread around causing soil and water pollution.

Fire and explosion may occur due to electric shock, thunder etc. and cause damage to human lives and property.

Occupational health of the operators would also be concerned as from time to time they would be in contact with chemical such as acid, soda which are corrosive and has harmful health effect if workers contact directly. Sludge, if in direct contact, may also cause some health risks to the workers

3.7.Induced Impacts

At present, existing land use along the road and Tri river's embankment alignment are rice field and land unused. In addition, the road passes through the residential area of Ky Hung commune. The shortest distance from the alignment to an existing house is 20-500 m, at the beginning section. When the new road is built and operated, land use along the road alignment will be changed in the tendency that residential houses will be built along the 3.75km road alignment. As the result, agricultural land will be changed to urban residential area. In fact, in the future, the area along the road alignment will be change to urban residential area in accordance with the city's Masterplan. The existing houses that are closest to the alignment will remained to be several rows back from the new road after new houses are built on existing agricultural land along the alignment thus land price of these existing residential houses are not expected to increase abruptly. Therefore, the potential induced impacts would be undercontrol. There is no foreseenable adverse potential environmetal impacts that could happen in the area along the road after it is built according to which land use along the proposed road has also been planned for urban residential land as shown in the map below.

Figure 38: Ky Anh Town's Land Use Planning

Residential land has been planned along the new urban roads. The main safeguard issues would be access to clean water supply, drainage, sewer, and solid waste collection. While the first three would be included as part of land development in each area, the fourth would be covered by the existing town solid waste collection service. Generally, the induced impacts would be addressed at city plan/development level instead of this subproject level.

CHAPTER 4. ANALYSIS OF ALTERNATIVES

The objectives of the analysis for alternative technical designs options of the investment supported under the project are to compare social and environmental impacts associated with those design options. The final options are selected based on a thorough consideration of the technical, economical, effective, environmental and social aspects of the proposed options.

The implementation of the Ky Anh sub-project is in line with the following plans and planning: (i) Decision No. 1076/QD-TTg dated 20 August 2007 of the Prime Minister approving the master plan for the construction of Vung Ang Economic Zone, Ha Tinh Province up to 2025; (ii) Decision No. 445/QD-TTg dated 07/4/2009 of the Prime Minister Approving the Adjustment of Orientations for Master Plan for Development of Vietnam's Urban System; (iii) Decision No. 830/QĐ-ttg dated 02/6/2014 by the Prime Minister Approving the Planning Project for Construction of South Ha Tinh - North Quang Binh Region by 2030; (iv) Decision No. 3774/QD-UBND dated 29/9/2015 of Ha Tinh People's Committee Approving the Project on Partial Adjustment of the General Planning on Construction of Vung Ang Economic Zone, Ha Tinh Province up to 2025, scale 1/10,000; (v) Master Plan for Socio-Economic Development in the North Central Coast and Central Coast to 2020; (vi) General planning of Ky Anh town, Ha Tinh province to 2035; (vii) Detailed Planning for Flood Prevention and Control in Dredged Rivers of Ha Tinh Province in the Period 2015-2020 and Orientation to 2030.

4.1 "With Project" and "Without Project" Scenarios

The existing challenges in the project area is (iii) urban space is limited, not meeting development needs; (iv) Inadequate transport system; (v) pollution risks due to wastewater has not been collected for treatment before being discharged into the environment. Therefore, if the project is not implemented, negative social and environmental issues will have to exist under current conditions:

- The industrial and urban development of Ky Anh implies the risk of environmental pollution, especially the problem of waste and wastewater. At present, Ky Anh has started to appear in many areas contaminated by waste, unmanaged sewage, hygienic treatment.
- Due to the development of the urban area, the rapidly increasing population will lead to the rapid increase in the demand for water in each year. As a result, the amount of waste water will also increase and further pressures on the environment.
- The Ky Anh town is developing along the National Highway 1A, with a density of population concentrated in the Song Tri, Ky Trinh, Ky Hoa ward... If not building the trunk center road would not solve the problem of the space it contests, trade in services, the administrative center and the public space in order to meet the needs and the speed of urbanization of town;
- Without the construction of a central urban connection road, traffic density and traffic safety risks on National Highway 1A will increase due to the fact that the traffic volume has been and will be used as the main traffic route. Meanwhile, the amount of vehicles is increasing due to urban development.

The comparison between environmental and social issues associated with the With and Without Project alternative is described in Table 63 below.

Table 63:Analysis of "With" and "Without Project" Alternative

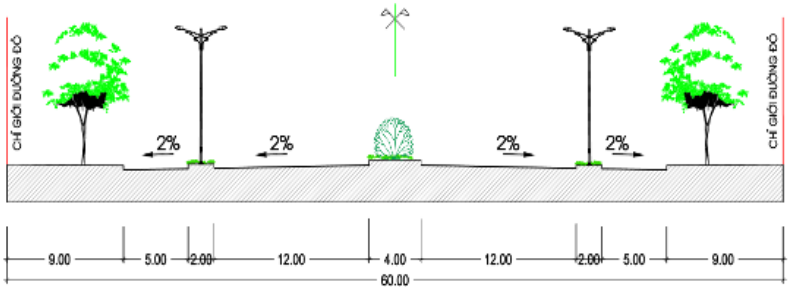
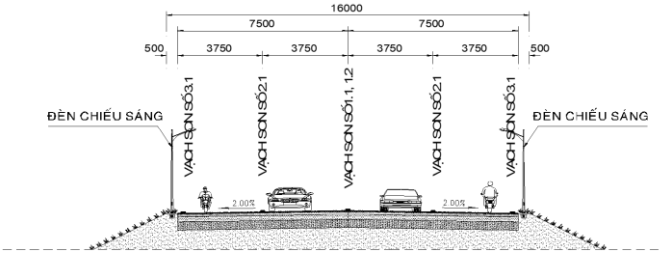
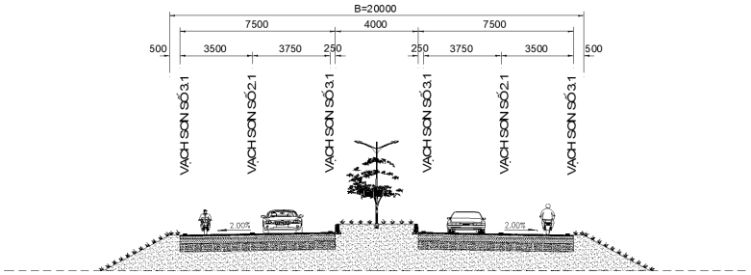
No	Environmental and Social Problems	With Project	Without project
1	Flooding	Improved	No improvement, intensity and frequency increase
2	Environmental sanitation	- Improve urban sanitation, reduce pollution and disease risks associated with wastewater and environmental sanitation, and improve the quality of life for people in the project area. - Improving urban services, ensuring the beauty and sustainable development of Ky Anh Town in the development process	- Environmental sanitation and quality of life will not be assured due to lack of wastewater treatment system, stagnant water in Thuy Son lake, affecting urban beauty
3	Traffic Safety	- Investment in construction items will facilitate the movement of people, reduce traffic jams	- There will be significant pressure on traffic density and safety on existing roads.
4	Embankments and lakes	- The embankment and the two sides of the Tri River will improve drainage capacity, reduce waterlogging, improve waste water drainage capacity to prevent river bank erosion and create urban landscapes. - The renovation of Thuy Son lake will improve the surrounding landscape and enhance drainage capacity, reduce flooding in the central area of Song Tri Ward.	- Traffic in this area will be difficult - The existing area of the lake will remain a place with open drainage channels with odours and environmental pollution, many wild plants and weeds, creating a bad landscape.

4.2 Analysis of Road Options

Three options of the central urban connection routes have been proposed. The ESIA report analyses the economic, technical, environmental, and social factors of each option with the analysis results shown in the following Table.

Table 64: Comparison of Options for the Central Urban Connection Routes

Content	Option 1 (Planning)	Option 2 (Phasing investment)
Option description	- To construct the whole Ky Trinh urban central road as in the master plan - Type: Main urban road; - Design speed: 60km/h; - Road surface: A1 asphalt concrete surface - Scope: - B=4+12x2+2x2+5x2+9x2=60m; - With full technical infrastructure like sidewalk, drainage system, lighting system, trees ….	- Investment in phases for each section - Section 1: From Km0+00 to Km0+450, L= 0.45km: 7.5x2+2x0.5=16m - Section 2: From Km0+450 to Km3+737.89, L=3.288km: 4+7.5x2+0.5x2=20m - Type: Main urban road; - Design speed: 60km/h; - Road surface: A1 asphalt concrete surface;

Content	Option 1 (Planning)	Option 2 (Phasing investment)
		- Scope: B= 22+10x2+9x2=60m; - With full technical infrastructure like sidewalk, drainage system, lighting system, trees ….
Cross section of Option 1	 ***Option 1 – Investment as in planning***	
Cross section of Option 2	 ***Cross section for Section 1 for the main road connecting urban centers***  ***Cross section for Section 2 for the main road connecting urban centers***	
Economy	- High investment cost - Not fully utilizing the investment because the present demand is not high. - High site clearance cost;	- Low investment cost; - Low site clearance cost
Environmental impact	- Construction time is longer thus local communities would be affected in longer duration - and the excavation amount is largest (52.802 m3)	- Construction time is shortest thus local communities would be affected in shorter duration - and the excavation amount is smallest (31.681 m3)
Social impact	- Site clearance and the impact of household is biggest (119,954 m2)	- Site clearance and the impact of household is smallest (71,972 m2)
Conclusion	Option 2 will be selected because: - It is suitable with financial investment plan and socio-economic condition at present. - It has low impact on site clearance and compensation - It ensures traffic connectivity, in line with the planned alignment and can be expanded for planning and urban development in the future - It is feasible in socio-economic aspect as Donor's criteria.	

4.3 Analysis of the Main pipeline and WWTP Options

Siting of the WWTP was based on recommendations from town masterplan, the WWTP was proposed to be located in vacant land in Ky Hung ward near Tri river. During feasibility study/ESIA preparation, the siting of the plan was further considered to ensure that the site is technically and environmentally suitable. The location of a WWTP satisfy:

- Near a receiving waterbody (the Ky Anh WWTP is 80 m from river)
- At downstream of the receiving water body (the discharge point is at downstream section of the Tri river).
- Away from populated/residential area.
- Avoid land acquisition on populated/ residential area. (the Ky Anh WWTP is on existing low productivity agricultural land, 500m from the nearest house).

Table 65:Comparison of Options for Wastewater Collection System

No	Criteria	Option 1: Combined drainage system	Option 2: Separate drainage system	Option 3: Semi-separate drainage system
1	Option description	To use the combined drainage system for both rainwater and wastewater.	To use separate drainage system for rainwater and wastewater.	To make use of the existing culvert system in the area and construct new system at other area
2	Economical aspect	Lower cost than Option 2	Higher cost than Option 1	Higher cost than Option 1 and lower cost than Option 2
3	Environmental aspect	Not thoroughly collect and treat wastewater, not fully solve the environmental pollution. Partially make use of the existing drainage system so the construction volume will be reduced, environmental impact will be reduced	Stinky smell will be minimized because wastewater will be collected by separate systems.	Not thoroughly collecting and treating wastewater, not fully solve the environmental pollution
4	Social aspect	Not require site clearance and resettlement.	Not require site clearance and resettlement.	Not require site clearance and resettlement.
5	Conclusion	Based on: (i) Economic, environmental and social aspects of mentioned solution; (ii) Actual condition of drainage system; (iii) Budget source for project implementation (iv) Characteristic and urban scope of Ky Anh town which is a new town and not having drainage system, then Option 3 will be selected.		

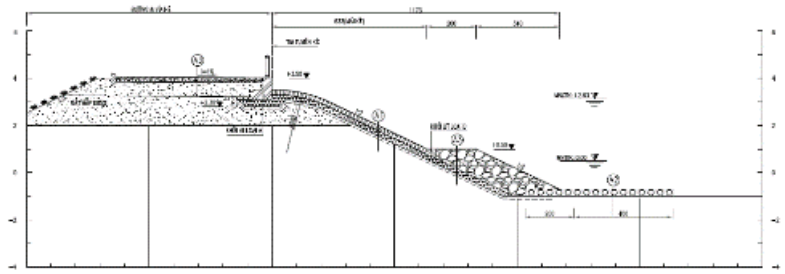
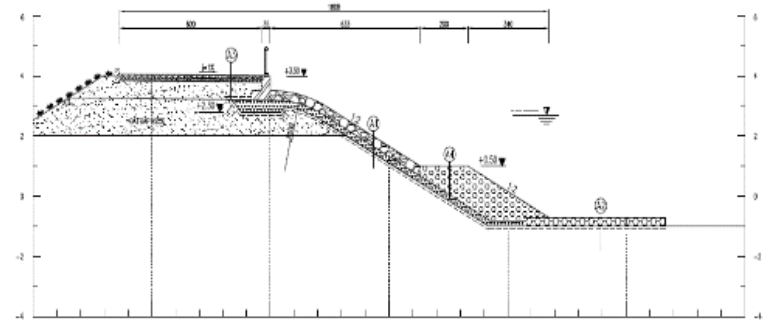
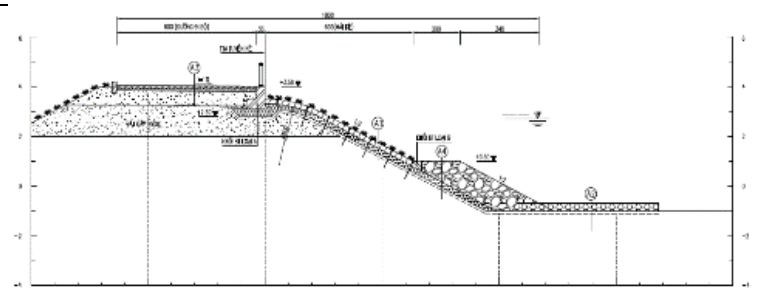
Table 66: Comparison and Selection of Options for Wastewater Treatment system

No	Criteria	Option 1: Sequencing Batch reactor technology (SBR)	Option 2: Oxidation ditch	Option 3: Biological pond
1	Option description	This technology uses sequencing batch reactor with activated sludge.	Oxidation ditch is the reformed technology of aero tank with complete mixing instrument in aeration and suspended activated sludge circulating in the ditch.	The wastewater treatment technology by biological ponds use natural biochemical processes to deposit and decay sediments based on existence and operation of anaerobic micrograms.
2	Economical aspect	- Low initial investment cost - High operation and maintenance cost	- Highest initial investment cost among the three options - Higher operation and maintenance cost than option 1 and option 3	- Low initial investment cost - Lowest operation and maintenance cost
3	Environmental aspect	It is possible that the effluent at the discharge stage sweeps with deposited sludge and foam. The work has simple structure, small size, occupies small land area so the impacts of land acquisition, dust, noise and safety risk during construction process are negligible.	- Suitable with the quality and flow of the influent wastewater which varies seasonally over the time. - High treatment efficiency, meeting strict standard requirements. - The works do not occupy large land area so the impacts of land acquisition, dust, noise, safety risks during the construction process is negligible.	- Able to generate bad odour (especially in the summer) - This option will require acquisition of large land area so the excavation volume is huge (~ 90,000m3) so the impact due to dust, noise, risk during construction is greater than the Options 1 and 2. - It is possible to affect the water quality of the Tri river if the system has to discharge.
4	Social aspect	- Require not very large land area (<2ha)	- Require not very large land area (<2ha)	- Require very large land area (5ha)
5	Conclusion	Option 3 – Biological pond technology has the following major advantages: (i) lowest investment in the construction of treatment plant; (ii) lowest operating management cost; (iii) Lowest cost to treat 1 m^3 of wastewater; (iv) Easy and convenient operation and management. Therefore option 3 will be selected.		

4.4. Construction of Tri River Embankment and Operation Roads on Its Banks

Lining embankment for Tri river aims to protect the river bank, prevent landslide and sedimentation to protect the river's flow rate, ensuring drainage capacity.

Table 67: Comparison of Options for Tri river Embankent and Operation Roads On Its Banks

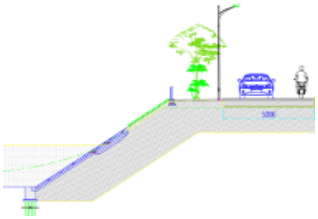
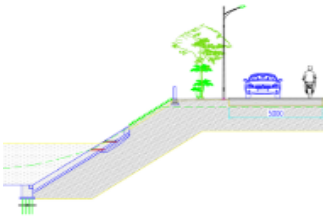
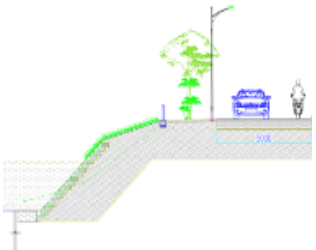
Criteria	Option 1	Option 2	Option 3
Option description	Slope embankment by precast concrete slabs. Construct operation roads with full technical infrastructure on the road including lighting system, drainage system, wastewater sewer and trees.	Embankment lining by stone. Construct operation roads with full technical infrastructure on the road including lighting system, drainage system, wastewater sewer and trees.	Embankment lining by geo-cells for grass planting; Construct operation roads with full technical infrastructure on the road including lighting system, drainage system, wastewater sewer and trees
Embankment structure – Option 1			
Embankment structure – Option 2			
Embankment – Option 3			
Economical aspect	- High construction cost - Lowest maintenance cost	- Medium construction cost - Medium maintenance cost.	- Low construction cost; - Highest maintainance cost ;
Environmental aspect	- Well solve flooding and sanitation, bring safe	- Well solve flooding and sanitation, bring safe living	- Well solve flooding and sanitation, bring safe living

Criteria	Option 1	Option 2	Option 3
	living environment for local people - Embankment concretization will not create greenery space for the river	environment for local people - Embankment concretization will not create greenery space for the river - Transport and temporary gathering of stone can lead to higher safety risk compared with transport and temporary gathering of precast concrete slabs.	environment for local people - Create greenery space and grassland on the embankment, help regulate the air
Social aspect	Convenient for people's movement and access to the embankment	Convenient for people's movement and access to the embankment	Difficult for rescuing in case of unexpected incidents
Conclusion	By analyzing and assessing the three mentioned Options, Consultant recommends Option 1 for the investment in Tri river embankment because it has good bearing capacity against water pressure, high aesthetics, low maintenance cost, in harmony with many embankments under construction in local area and in accordance with planning orientation		

4.5. Upgrading, Rehabilitation of Thuy Son Lake

This item is invested to bring a safe living environment for local people and create a highlighted landscape for uban area as well as to create more space for community's activities.

Table 68: Comparison and Selection of Options for the Lake Embankment

Criteria	Option 1 (Lining slope embankment by concrete slabs)	Option 2 (Lining slope embankment by stone)	Option 3 (Ecological flexible embankment)
Option description:	- Lining the lake embankment by concrete slabs and cells for planting grass with slope 1:1. - Constructing technical infrastructure includes: sidewalk, rainwater drainage and sewer, and trees. 	- Lining the embankment by stone and reinforced concrete cells for planting grass, slope 1:1.5. - Constructing technical infrastructure includes: sidewalk, rainwater drainage and sewer, and trees.  Typical embankment cross section – Option 2	- Lining the embankment by sand bags and retaining wall; - Constructing technical infrastructure includes: sidewalk, rainwater drainage and sewer, and trees. 

Criteria	**Option 1 (Lining slope embankment by concrete slabs)**	**Option 2 (Lining slope embankment by stone)**	**Option 3 (Ecological flexible embankment)**
	Typical embankment cross section – Option 1		Typical embankment cross section – Option 3
Economical aspect	- High construction cost. - Low maintenance cost.	- High construction cost. - Low maintenance cost.	- Low construction cost. - High maintenance cost.
Environmental aspect	- Fully solve environmental pollution, create more beautiful landscape to be a highlighted spot for the town, maximize investment efficiency. - Concretizing the embankment, forming greenery space for the lake by grass cells	- Fully solve environmental pollution, create more beautiful landscape to be a highlighted spot for the town, maximize investment efficiency. - Concretizing the embankment, forming greenery space for the lake by grass cells	- Fully solve environmental pollution, create more beautiful landscape to be a highlighted spot for the town, maximize investment efficiency. - Create greenery space and grassland on the embankment, help regulate the air
Social aspect	- Easy for rescuing work in unexpected incident	- Easy for rescuing work in unexpected incident	- Difficult for rescuing work in unexpected incident
Conclusion	After mentioned analysis, Option 1 will be selected for the investment in upgrading and rehabilitation of Thuy Son lake because it will form highlighted landscape, in line with the planning orientation. This will be a greenery space in Song Tri ward, contributing to regulate the air and improve urban aesthetic.		

CHAPTER 5. ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN

With the potential impacts and risks identified and assessed in Chapter 3, an Environmental and Social Management Plan (ESMP) has been prepared in this chapter with the aims of impact prevention and mitigation. Procedures for implementation, monitoring, supervision and reporting are also included in this ESMP together with Capacity building program and cost estimation. This ESMP consists of main contents as follows:

- The measures to minimize the potential environmental impacts from Feasibility Study and Detailed Design stage to pre-construction, construction and operation phases together with implementation responsibilities;
- Environmental Monitoring Program;
- The Project Compliance Framework, including environmental and social supervision arrangements, fines applicable to non-compliance;
- Capacity building programs;
- Cost estimation; and
- Grievance Redress mechanism.

5.1 Mitigation Measures

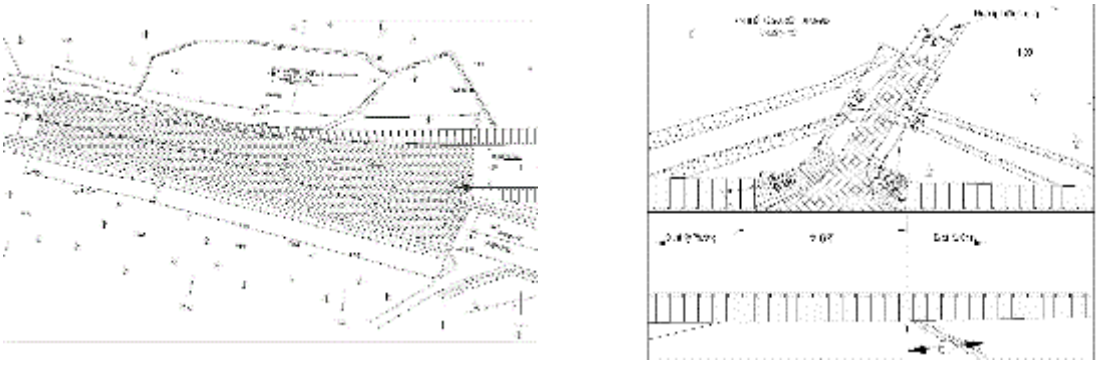
5.1.1 Measures Incorporated in the Feasibility Study and Detailed Design

The following measures were considered during the preparation of the feasibility study and will be integrated in the detailed designs to mitigate the potential socio-environmental impacts and risk. Environmental friendly solutions will also be considered during the FS and detailed design:

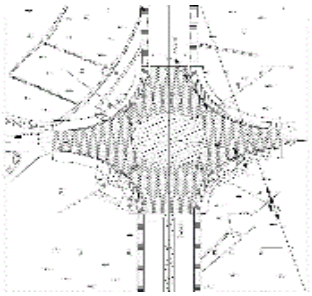
Trunk Road:

- Protect slopes with vegetation cover and concrete frames and/or embankments
- Install vertical and longitudinal drains to ensure stability of the roads
- Build the intersections with traffic safety control measures at intervals to maintain access for local communities to travel from one side of the road to the others.
- Lighting: Using energy saving bulbs and automatic control. Lamp design ensures aesthetic factor.
- Plant trees to create urban green landscapes in the divider and on the sidewalk.
- Design the intersections between the trunk road and existing road with measures to ensure traffic safety as warning lights, reflective traffic signs, deceleration ramps, fences,

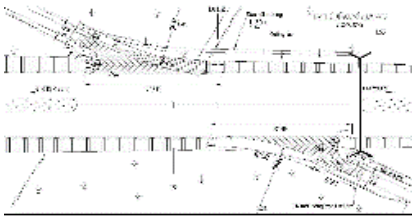
Figure 40 shows the design of the intesections between the main road connecting urban centers and the existing road in which traffic and safety control measures included



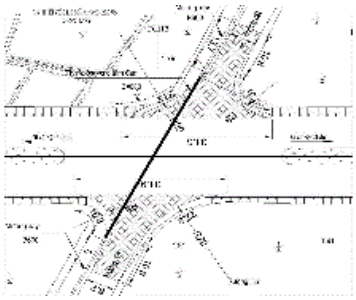
Beginning point- Connect with the access road to Formosa Industrial Park - Km 0+000



The intersections between the trunk road and existing road - km0+285



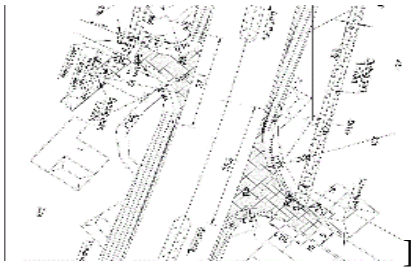
The intersections between the trunk road and existing road - km0+440



The intersections between the trunk road and existing road – km1+190

The intersections between the trunk road and existing road – km2+238

The intersections between the trunk road and existing road – km2+770



The intersections between the trunk road and existing road – km2+841

The intersections between the trunk road and existing road – km3+021

The intersections between the trunk road and existing road – km3+152

The intersections between the trunk road and existing road – km3+737

Figure 39: Design Intersections Between the Trunk Road and Existing Road

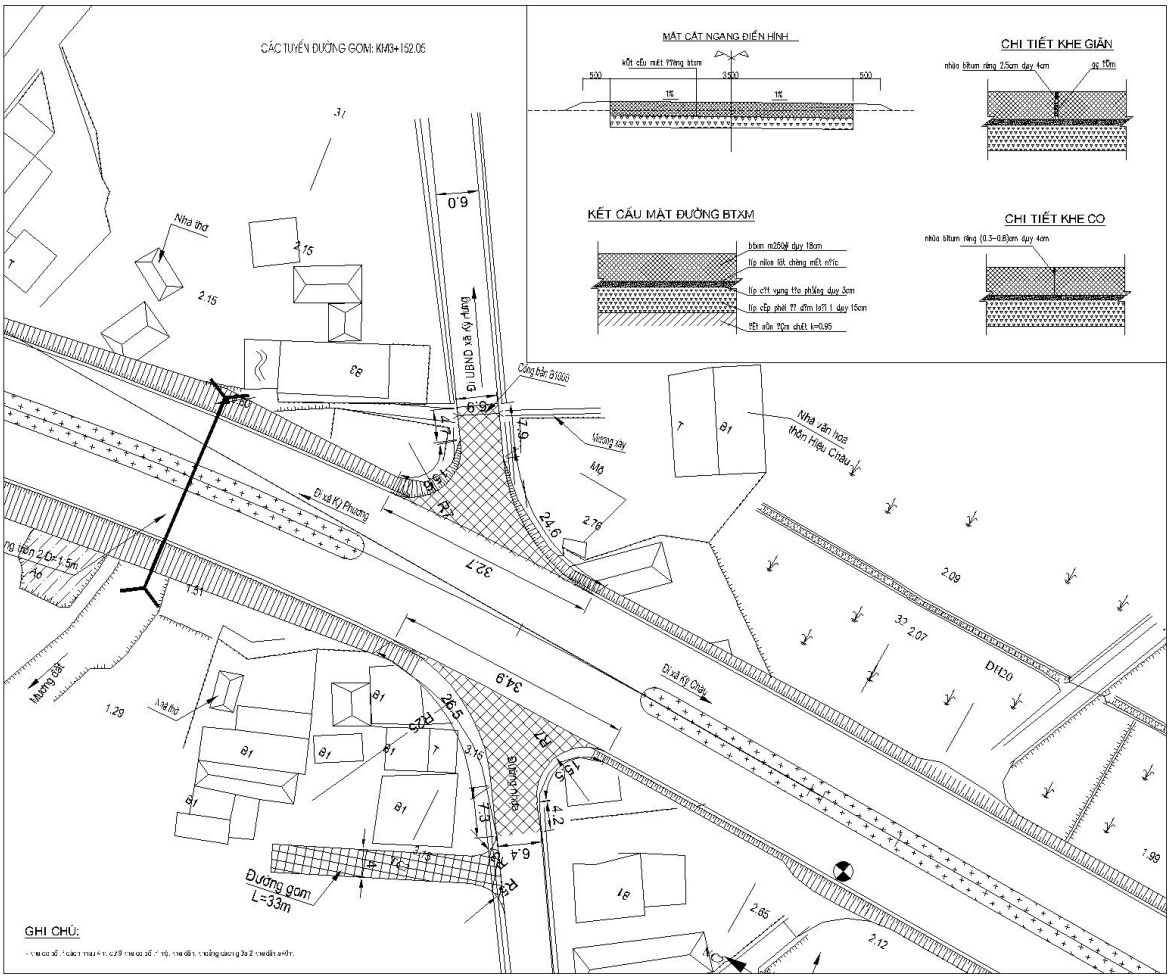


Figure 40: Drawings of the typical road surface at elevated positions

Thuy Son Lake:

- Adjust the sidewalks and walks around the lake to improve the urban landscape after renovating the lake.
- Design green space on the embankment by planting grass plots.
- The design of steps up and down must be large enough to ensure safety during operation.
- Design piles and chain to ensure the safety of people walking along the embankment, especially the opposite area of Song Tri Primary School

Tri River Embankment Lining and Riverside Roads

- Design green space on the embankment by planting grass plots
- The design of steps up and down must be large enough to ensure safety during operation.
- Lighting: Using energy saving bulbs and automatic control. Lamp design ensures aesthetic factor.
- The density of trees on sidewalks suitable for urban landscape.

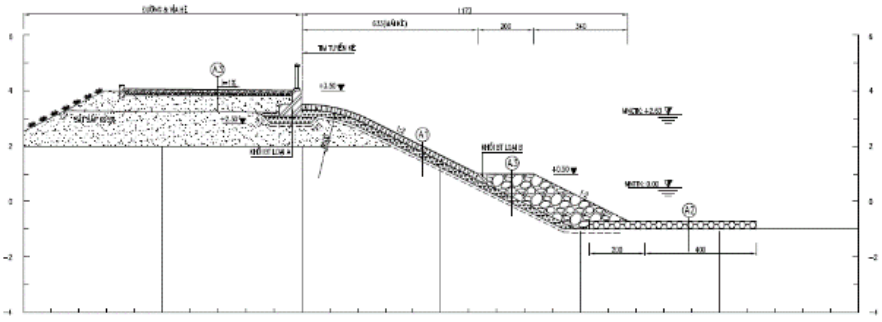


Figure 41: Typical Cross Section of Embankment

The WWTP and PSs

- Location of the WWTP to include 300m diameter buffer zone according to applicable Vietnamese regulations in Vietnamese standard TCVN 7222 :2002[16]
- The WWTP's outlet area has erosion control and hazard warning. The outlet is disposed at the outlet of the disinfection tank, with HDPE pipe. The outlet works by opening and closing the manual valve.
- Design fences and trees around the plant to ensure safety, create green landscape and limit odor pollution.
- Design and location of PSs ensure safety factor

5.1.2 Measures to be Implemented in Pre-construction Phase

5.1.2.1. Measures to Prevent Safety Risks Related to UXO

Unexploded bombs and mines will be searched for removal right after completing the compensation for site clearance and before carrying out the leveling of the site. This is required to be made prior to the construction of new road sections and road enlargement. The project owner will sign contract with a military civil engineering unit or a professional organization for searching, detecting and destroying bombs and mines. The cost for clearing bombs and mines is estimated at around 1.75 billion Vietnamese Dong (77,677 USD equivalence).

5.1.2.2. Measures to Address the Impacts of Land Acquisition and Resettlement

As discussed in Chapter 3, the Project would acquire permanently approximately 170,258m2 of land, in which the majority is agricultural land (79.7%); The residential land to be acquired accounts for 14.0% of total land areas of Ky Hung, Ky Trinh, Ky Hoa communes and Song Tri ward. the project will affect temporarily 38,766m asphalt road and concrete road in the residential areas of Song Tri, Ky Trinh wards and 3 communes of Ky Hoa, Ky Huong and Ky Chau during construction phase. Totally, 344 households (HH) would be affected by land acquisition under the Project. The impacts of land acquisition would be most significant on 91 severely affected households (AHs)[17], particularly the 14 HHs who has to be relocated and 2 other vulnerable

[16] TCVN 7222:2002: Environmental requirement for centralized wastewater treatment plants
[17]Severely affected HHs are i) normal HH with from 20% of total agricultural land to be acquired; or vulnerable HH with from 10% of total agricultural land to be acquired;

severely AH[18] in this group. In addition, the impacts of land acquisition would also be significant on 14 other vulnerable AHs but not severely.

To mitigate the potential impacts of land acquisition, Resettlement Plans were (RPs) were prepared for the sub-project with estimated budget of approximately 82.57 billion VND. This budget will cover the costs of compensation and support, monitoring, management costs and contingencies. Details about compensations and supports paid to the affected households are presented below.

Table 69: Compensation and Supports to Affected Households

No.	Description	Volume	Amount
A	**Land**		**44,897,686,567**
A.1	Residential land	19,416	39,341,603,000
A.2	Agricultural land	128,594.58	5,556,083,567
B	**House/structure**		**12,988,870,000**
B.1	House (m2)	2,140	10,272,000,000
B.2	Kitchen (m2)	440	660,000,000
B.3	Barn/breeding facilities (m2)	300	375,000,000
B.4	Auxiliary facilities (m2)	240	480,000,000
B.5	Wall (m)	2,150	731,000,000
B.6	Yard (m2)	2,340	421,200,000
B.7	Gate (piece)	35	26,250,000
B.8	Water tank (m3)	12	19,920,000
B.9	Well (piece)	10	3,500,000
C	**Crop, vegetation**		**1,335,713,580**
C.1	Rice	57,648	288,239,500
C.2	Crops	59,703	358,215,840
C.3	Tea tree	10169	162,701,440
C.4	Wood tree	1500	300,000,000
C.5	Fruit tree	800	190,000,000
C.6	Shrimp farming land	1,075	36,556,800
D	**Sub-total 1**		**59,222,270,147**
E	**Assistance**		**16,526,838,763**
E.1	Assistance for transportation, resettlement	14	84,000,000
E.2	Assistance for house renting for displaced HH	14	100,800,000
E.3	Assistance for life stabilization	344	3,219,840,000
E.4	Career change	128,595	12,160,198,763
E.5	Vulnerable household	16	32,000,000
E.6	Business establishment	11	55,000,000
E.7	Self-relocation	14	700,000,000
E.8	Incentive bonus	35	175,000,000
F	**Sub-total 2**		**75,749,108,910**
G	**Management cost**		**6,817,419,802**
G.1	Implementation cost		1,514,982,178.20

[18] Vulnerable HHs are either poor HH, female-headed households with dependents, or HH under the care of social policy

No.	Description	Volume	Amount
G.2	Independent monitoring consultant cost (2%)		1,514,982,178.20
G.3	Contingency cost (5%)		3,787,455,445.49
H	**Total**		**82,566,528,712**
	Rounded		**82,570,000,000**
	In USD		**3,669,778**

Compensation and supports given to the affected households will be based on the following key principles:

- All Project Affected People (PAP) who have assets within or reside within the area of project before the cut-off date are entitled to compensation or/and assistance for their losses. Those who have lost their income and/or livelihood will be eligible for livelihood rehabilitation assistance based on the criteria of eligibility defined by the project in consultation with the PAPs. If, by the end of the project, livelihoods have been shown not to be restored to pre-project levels, additional measures will be provided.
- The compensation rates will be determined based on the results of independent appraisal of the land/crops/assets (associated with the land) at time of resettlement implementation in a consultative manner. All fees and taxes on land and/or house transfers will be waived or otherwise included in a compensation package for land and structures/or houses or businesses. The local authorities will ensure that PAP choosing relocation on their own, obtain, without additional costs, the necessary property titles and official certificates commensurate with similar packages provided to those who choose to move to the project resettlement sites.
- Land will be compensated "land for land" if the local land fund is available, or in cash, according to PAP's choice. The choice of land for land must be offered to those loosing 20% or more of their productive land. If land is not available, the borrower must assure itself to meet the Bank's requirements that this is indeed the case. Those loosing 20% or more of their land will have to be assisted to restore their livelihood. The same principles apply for the poor and vulnerable people losing 10% or more of their productive landholding.
- PAPs who prefer "land for land" for residential land will be provided with land plots with the equivalent quality for lost lands or a combination of land (a standard land plot) in a new residential area nearby the original resident, and cash adjustment for difference between value of their lost land and the land plots provided. The resettlement area will be planned properly and implemented in consultation with the PAPs. All basic infrastructures, such as paved roads, sidewalks, drainage, water supply, and electricity and telephone lines, will be provided.
- PAPs who prefer "cash for land" will be compensated in cash at the full replacement cost. These PAPs will be assisted in rehabilitating their livelihoods and making their own arrangements for relocation.
- Compensation for all residential, commercial, or other structures will be offered at the replacement cost, without any depreciation of the structure and without deduction for salvageable materials. Structures shall be evaluated individually. Any rates set by category of structure must use the highest value structure in that group (not the lowest) to ensure PAP can build a new structure with similar technical standard and category.
- Households who have to relocate but ineligible for compensation for affected land and

have not any land or house within the project commune/ward will be entitled to buying a minimum plot or house in resettlement site and resettlement assistance in cash.

- PAPs will be provided with full assistance (including a transportation allowance) for transportation of personal belongings and assets, in addition to the compensation at replacement cost of their houses, lands and other properties. Full compensation and allowance must be provided to affected households prior to the taking of affected land and assets.
- Additional efforts, such as economic recovery assistance, training and other forms of assistance, should be provided to PAPs losing income sources, especially to vulnerable groups, in order to enhance their future prospects toward livelihood restoration and improvement.
- As RP is one of the project components, the project will not be considered complete until the RP has been fully implemented and met OP 4.12 policy objective.

Compensation will be made to the affected households for the assets that are lost/affected, including their loss of income as a result of land acquisition. In addition to compensation, households who are severely affected will be provided with additional financial support for resettlement. They are also eligible for participating in the Livelihood Restoration Program that was designed based on their needs to assist them in promptly restoring their livelihood as a result of loss of land/business/crops, or as a result of physical relocation. In addition to the compensation and support, other measures will be taken to mitigate the potential adverse impact, including early notification of land acquisition (i.e. before 90 days for agricultural land and 180 days for residential land), resettlement site is constructed close to the existing households. During resettlement process, consultation will be conducted regularly to ensure comments and feedback of affected households are considered to avoid/mitigate the resettlement impact. Temporary impact on existing living and business activities will be mitigated by allowing the households to continue using their existing houses and running their current business until their new houses are ready to move in. Contractors will apply all possible mitigation measures to avoid and/or mitigate negative impacts on local people during construction with closely monitoring by PMU and local community.

Gender Mainstreaming:

Below are some suggestive actions to promote gender equality through the implementation of RP for Ky Anh.

Gender Action: As part of RP implementation, the following gender actions will be made.

- Education: The surveyed results show that, there is no educational restrict for female in the project area. At present, all children at school age can go to school regardless their gender, household's economic condition and religion.
- Property's ownership: According to the Land law 2013, husband and wife should share the name in their land use right certificate. However, the surveyed results show that, 31.5% of surveyed people said their land use right certificates bear only husband's name while the percentage for wife holding name in the land use right certificate is 15.3%.

The project's benefits for female beneficiaries:

- The work item of the trunk road connecting urban centers will provide better access to social service, market and job opportunities for people living along the road. The trunk road will also reduce travel time and increase the job opportunities and business activities for women.

- The work item of Tri river embankment and the wastewater collection and treatment plant will help to improve environmental condition, reduce environmental-borne diseases (gynecological disease, venereal disease…), that will help to reduce medical check time and treatment cost. Women will have more time and better financial condition to improve their capacity.

5.1.3 Measures to be Implemented During Construction Phase

As discussed in Chapter 3, the potential impacts and main risks that may occur during the construction include: (i) Air Quality Reduction: increased levels of dusts and exhaust gas, odor, noises, vibration; (ii) Wastewater generation; (iii) Solid wastes generation; (iv) Surface Water quality reduction; (v) Impacts on Biological Resources; (vi) Urban landscape; (vii) Increased erosion and landslide risks; (viii) Increased flooding, sedimentation, risks; (ix) Traffic Disturbance and Increased traffic safety risks; (x) Damages to existing infrastructure and or disruptions to related services; (xi) Social impacts: disturbance to businesses and daily activities of local people; (xii) Impacts on cultural, historical resources; (xiii) Community Safety and Health; (xiv) Health and safety of workers. In addition, some special impacts by types of work, such as destructive explosion, construction of bridge or sensitive locations along the route, have also been identified.

Below are the mitigation measures to be implemented during the construction phase of the project and presented by category:

General mitigation measures presented as ECOP (Environmental Codes of Practice). ECOP will be applied to all bid packages by the contractors and supervised by the construction supervision consultant (or Engineer).
Mitigation measure applicable to specific types of activities to be carried out; and
Site-specific mitigation measures to address site-specific potential impacts and risks

Bidding documents and construction contracts of each bid package will include the entire ECOP and specific mitigation measures by type of construction activity and location consistent with the work content in the bid package.

The contractors will be required to prepare Site-Specific Environmental and Social Management Plan (SESMP) and submit to the Construction Supervision Consultant and the Ky Anh Project Management Unit for review and approval at least two weeks prior to construction commencement. The SESMP will be prepared to meet the mitigation requirements described in below.

5.1.3.1. Environmental Codes of Practice (ECOP)

The mitigation measures for common negative impacts during the construction phase are presented in Tables 59 in the form of Environmental Codes of Practices (ECOP). ECOP will be included in all bidding documents and construction contracts of all bid packages to request the contractors to implement. ECOP compliance will be supervised by the Construction Supervision Consultant (CSC) in coordination with PMU.

ECOP, together with relevant type-specific and site-specific mitigation measures will be included in the construction contract signed between the PMU and the Contractor. In addition, each contractor will be required to prepare Site-specific Environmental Management Plan (SEMP) to cover all measures that the contractor will carry out to address potential impacts and risks associated with the works that they are contracted to implement.

- Impacts on air quality because of dust, exhaust, noise, and vibration

- Wastewater
- Solid waste
- Reduced water quality
- Flooding risks
- Water pollution
- Erosion and Sedimentation
- Traffic Disturbance and Safety Risks
- Impacts on organism, aquatic system
- Impacts on urban landscapes,
- Impacts on Cultural Heritages
- Social Impacts
- Community Health and Safety
- Workers' Health and Safety
- Hazard Risk
- Chance findings

Table 70: Environmental Codes of Practices (ECOP)

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	Supervised by
1) Generated Dust, Emission, Noise, Vibration	• Maintain the level of emission at construction sites within the permissible limit provided for in QCVN 05: 2013/BTNMT: National Technical Regulation on Ambient Air Quality. • Vehicles in Vietnam must undergo a regular emissions check and obtain certification: "Certificate of conformity from inspection of quality, technical safety and environmental protection" following Decision No. 35/2005/QD-BGTVT • Carry out watering for dust control at least 3 times a day: in the morning, at noon, and in the afternoon during dry weather with temperatures of over 25^{o}C, or in windy weather. Avoid overwatering as this may make the surrounding muddy. • Exposed soil and material stockpiles shall be protected against wind erosion and the location of stockpiles shall take into consideration the prevailing wind directions and locations of sensitive receptors. • Dust masks should be used by workers where dust levels are excessive • There should be no burning of waste or construction materials on site. • Cement processing plants should be far from residential areas. • Only use transportation vehicles with valid registry. • Neatly gather construction materials and wastes. Arrange for the workers to collect and gather construction materials and wastes to the designated places at the end of each day or shift. • Do not overload the materials/soils and stones to extreme heights onto trucks, as this may result in drops along transportation routes. Tightly cover the trucks carrying wastes and bulk materials before getting out of construction sites or quarries and borrow pits so as to restrict scattering along transportation routes. • Put temporarily gathered materials and waste heaps with a volume of about 20m3within barriers or covered so as to avoid dust dispersion. • Transport wastes out of construction sites to the designated locations for reuse or to the disposal sites in the soonest possible time. • Do not put vehicles and machines to run idle in more than 5 minutes. • Avoid preparations of construction materials such as mixing concrete near local people's houses or other sensitive works like pagodas, school gates, or offices. • Locate vehicle washing stations at the exit/entrance of big construction sites.	- QCVN 05: 2013/MONRE: National technical regulation on ambient air quality - QCVN 26:2010/BTNMT: National technical regulation on noise - QCVN 27:2010/BTNMT: National technical regulation on vibration - TCVN 6438-2005: Road vehicles. Maximum permitted emission limits of exhaust gas - Decision No. 35/2005/QD-BGTVT on inspection of quality, technical safety and environmental protection;	Contractor	PMU, CSC, IEMC

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	Supervised by
	• Periodically wash the trucks used for transporting materials and construction wastes. • Avoid construction operations generating great vibration and loud noise within the time between 6pm and 7am when construction takes place near residential areas. Night construction must be informed to the community at least 2 days in advance. • Perform the method of successive construction for each sewer section in construction sites of long sewer lines. • Observe and secure construction progress correctly. • When needed, measures to reduce noise to acceptable levels must be implemented and could include silencers, mufflers, acoustically dampened panels or placement of noisy machines in acoustically protected areas • Avoiding or minimizing transportation through community areas and avoiding as well as material processing areas (such as cement mixing).			
2) Wastewater Management	• The Contractor must be responsible for compliance with Vietnamese legislation relevant to wastewater discharges into watercourses. • Employ local workers to limit the amount of generated domestic wastes and wastewater. • Provide septic tanks for toilets for treating wastewater before it can be discharged into the environment. On-site mobile toilets with 3-compartment septic tanks can be used in areas for major work items as traffic roads. Wastewater from toilets as well as kitchens, showers, sinks, etc. shall be discharged into a conservancy tank for removal from the site or discharged into municipal sewerage systems; there should be no direct discharges to any waterbody • Wastewater containing pollutants over standards set by relevant Vietnamese technical standards/regulations must be collected in a conservancy tank and removed from site by licensed waste collectors. • Clear ditches around the workers' camps every week. • Build sedimentation ponds and ditches to receive stormwater runoff at the construction sites such as the areas for Thuy Son Lake, the WWTP, stormwater and wastewater pumping stations.	- QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater; - QCVN 40: 2011/ BTNMT: National technical regulation on industrial wastewater	Contractor	PMU, CSC, IEMC

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	Supervised by
	• Make appropriate arrangements for collecting, diverting or intercepting wastewater from households to ensure minimal discharge or local clogging and flooding. • Before construction, all necessary wastewater disposal permits/licenses and/or wastewater disposal contracts have been obtained. • At completion of construction works, wastewater collection tanks and septic tanks shall be safely disposed or effectively sealed off			
3) Solid Waste Management	• Before construction, a solid waste control procedure (storage, provision of bins, site clean-up schedule, bin clean-out schedule, etc.) must be prepared by the Contractors and it must be carefully followed during construction activities. • Before construction, all necessary waste disposal permits, or licenses must be obtained. • Solid waste may be temporarily stored on site in a designated area approved by the Construction Supervision Consultant and relevant local authorities prior to collection and disposal through a licensed waste collector. • Waste storage containers shall be covered, tip-proof, weatherproof and scavenger proof. • No burning, on-site burying or dumping of solid waste shall occur. • If not removed off site, solid waste or construction debris shall be disposed of only at sites identified and approved by the Construction Supervision Consultant and included in the solid waste plan. Under no circumstances shall the contractor dispose of any material in environmentally sensitive areas, such as in areas of natural habitat or in watercourses. • Limit waste pollution from litter and drop of materials. Place dustbins at the workers' camps. • Temporarily collect and separate domestic wastes. Provide watertight dustbins for domestic waste and tightly cover them to avoid giving rise to bad odors and leachate leakage, attracting flies, mice and other pathogenic species. Periodically collect and transport the waste to the dispose. • Perform concrete mixing on impermeable ground. Collect waste and wastewater containing cement through drainage ditches with sedimentation pits in construction sites before being discharged into receiving waters.	- Decision No, 59/2007/NĐ-CP on garbage management; - Decision No, 38/2015/NĐ-CP dated 24/04/2015 on waste and scrap management	Contractor	PMU, CSC, IEMC

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	Supervised by
	• Separate the components and parts which can be reused or recycled in the construction wastes before transporting the waste to Cup Coi borrow pit in accordance with design documents acceptable to the supervision engineer. • Weathered soil, wood and bricks can be reused for useful purposes such as ground levelling. Wood scraps may be used for cooking. Corrugated iron, iron, steel, packing materials and other materials which can be recycled can be delivered and sold to scrap traders. • Collect waste and tidy up construction sites at the end of a working day/shift and the transport waste out of the construction sites in the soonest possible time. If dredged materials are to be temporarily stored, necessary measures must be applied to control pollution such as gathering them within enclosures, under coverings, within fenced areas, etc. with warning signs. • The Contractor will sign a contract with URENCO Ky Anh to collect solid waste, conforming to Decree No. 59/2007/ND-CP dated 09 April 2007 on solid waste management and Decree No. 38/2015/ND-CP dated 24 April 2015 on management of waste and waste materials.			
4) Hazardous Waste Management	• Temporarily collect, store, and transported for treatment all hazardous wastes (road asphalt, waste oil and grease, organic solvents, chemicals, oil paints, etc.) in accordance with Circular No. 36/2015/TT-BTNMT on management of hazardous waste. • Collect and temporarily store used oil and grease separately in specialized containers and place in safe and fire-free areas with impermeable floors roofs, at a safe distance from fire sources. Sign contracts with for oil and grease to be delivered to suppliers/ manufacturers • Chemical waste of any kind shall be disposed of at an approved appropriate landfill site and in accordance with local legislative requirements. The Contractor shall obtain needed disposal certificates. • The removal of asbestos-containing materials or other toxic substances shall be performed and disposed of by specially trained and certified workers. • Used oil and grease shall be removed from site and sold to an approved used oil recycling company. • Used oil, lubricants, cleaning materials, etc. from the maintenance of vehicles and machinery shall be collected in holding tanks and removed from site by a	- Circular No. 36/2015/TT-BTNMT on hazardous waste management; - Decision No. 38/2015/NĐ-CP dated 24/04/2015 on waste and scrap management	Contractor	PMU, CSC, IEMC

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	Supervised by
	specialized oil recycling company for disposal at an approved hazardous waste site. • Used oil or oil-contaminated materials that could potentially contain PCBs shall be securely stored to avoid any leakage or affecting workers. • Unused or rejected tar or bituminous products shall be returned to the supplier's production plant. • Relevant agencies shall be promptly informed of any accidental spill or incident • Store chemicals appropriately and with appropriate labelling • Appropriate communication and training programs should be put in place to prepare workers to recognize and respond to workplace chemical hazards • Prepare and initiate a remedial action following any spill or incident. In this case, the contractor shall provide a report explaining the reasons for the spill or incident, remedial action taken, consequences/damage from the spill, and proposed corrective actions.			
5) Water Pollution	• The Contractor is responsible for controlling the surface water quality when discharging it out of the construction site, in accordance with QCVN 08-MT:2015/BTNMT – National Technical Regulation on surface water quality and QCVN 14:2008/BTNMT – National Technical Regulation on domestic wastewater quality. • Provide preliminary sedimentation ponds and ditches of stormwater runoff at the construction sites such as the areas for roads, regulation lake. • Provide construction workers on site with mobile toilets. • Avoid excavation and backfilling during rains. • Gather materials and wastes generated during excavation and backfilling, collect and transport them out of the construction site to the approved disposal sites within the soonest possible time. • Do not allow temporary gathering of bulk materials and mixing of concrete within 50m from ponds, lakes, rivers, streams, or other water sources. Maintain maximum distances possible between the gathering points to water sources in the construction of Tri river embankment. • Store used and unused oil and petrol in closed containers on impermeable ground covered with roofs and contained within surrounding banks for easy control and collection in case of leakage. Do not locate oil and petrol storages within 25m from ponds, lakes, rivers, and streams.	- QCVN 09:2008/BTNMT: National technical regulation on underground water; - QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater; - QCVN 40: 2011/ BTNMT: National technical regulation on industrial wastewater; - TCVN 7222: 2002: General requirements for concentrated wastewater treatment plants	Contractor	PMU, CSC, IEMC

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	Supervised by
	• Collect and transport excavated soils from the construction of sewers and ditches out of the construction site within 24 hours. • Only perform maintenance work of motored vehicles and equipment, including oil replacement or lubrication in designated areas, without allowing chemicals, petrol, oil, or grease to leak onto soil or into the drainage system or water sources. Trays are to be used to hold rags and materials used in maintenance. Collect and discard wastes in accordance with hazardous waste management regulation.			
6) Impacts on Plants and Aquatic Species	• The Contractor shall prepare a Clearance, Re-vegetation and Restoration Management Plan for prior approval by the Construction Engineer, following relevant regulations. The Clearance Plan shall be approved by the Construction Supervision Consultant and followed strictly by the contractor. Areas to be cleared should be minimized as much as possible. • Limit disturbances to areas with construction operations, especially in locations covered with green trees or vegetation. Do not use chemicals to clear vegetation. • Do not gather materials and wastes at places covered with vegetation or with green trees, but on vacant land instead. • Use sheet pile driving method using Larsen piles to limit impacts on the water quality. • If possible, green trees should be moved and replanted in other places if the trees are in the way of the pipelines to be constructed. • The contractor shall remove topsoil from all areas where topsoil will be impacted by construction activities, including temporary activities such as storage and stockpiling, etc; the stripped topsoil shall be stockpiled in areas agreed to by the Construction Supervision Consultant for later use in re-vegetation and shall be adequately protected. • Trees cannot be cut down unless explicitly authorized in the vegetation clearing plan. • When needed, temporary protective fencing will be erected to efficiently protect the preserved trees before commencement of any works within the site. • No area of potential importance as an ecological resource should be disturbed unless there is prior authorization from CSC, who should consult with PMU,	- Law on environmental protection No. 55/2014/QH13	Contractor	PMU, CSC, IEMC

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	Supervised by
	IEMC and the relevant local authorities. This could include areas of breeding or feeding for birds or animals, fish spawning areas, or any area that is protected as a green space. • The Contractor shall ensure that no hunting, trapping, shooting, poisoning of fauna takes place.			
7) Impacts on Urban Landscape and Beauty	• Carefully cover transport vehicles for materials and waste and periodically wash and clean the vehicles. • Dismantle the camps as well as other temporary works set up during construction and restore the site before the completed work could be handed over to the subproject owner. Back fill and tightly seal toilet pits, septic tanks, and temporary sewerage ditches. • Do not temporarily gather construction materials and wastes within 20m from the gate of schools, offices temples, pagodas, etc. • The Contractor will have to work out construction plans in such a way as to avoid the 1st and 15th days of each lunar month if construction is to be carried out near historical and cultural works such as pagodas, churches, temples, etc. • Regularly collect materials and wastes and tidy up the construction site. • Materials and waste around the construction site must be regularly collected and construction sites are to be neatly tidied up.	- Law on environmental protection No. 55/2014/QH13 - TCVN 4447:1987: Construction regulation - Circular No. 22/2010/TT-BXD on requirements on safety	Contractor	PMU, CSC, IEMC
8) Sedimentation, Erosion, Flooding, Subsidence and Slides	• Avoid disturbances and damage to the existing vegetation and green trees. • Periodically and thoroughly remove soils, stones and wastes from drainage sewers and ditches inside and around the construction site. • Neatly gather materials and wastes so as to limit them being swept away by stormwater. • Carry out ground levelling and rolling after discarding materials at disposal sites. • Install supports to protect the walls where excavation is deeper than 2 m.	- TCVN 4447:1987: Construction regulation - Circular No. 22/2010/TT-BXD: Regulation on construction safety - QCVN 08:2008/BTNMT – National technical regulation on surface water quality	Contractor	PMU, CSC, IEMC
9) Traffic Management	• Before construction, carry out consultations with local government and community and with traffic police. • Arrange and provide separate passageway with safe and easy access for pedestrian and for people with disability and mobility issues especially the	- Law on communication and transport No. 23/2008/QH12; - Law on construction No. 50/2014/QH13;	Contractor	PMU, CSC, IEMC

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	Supervised by
	areas in proximity of schools, including easy wheel chair access and hand rail. Make staff available any time for helping people with disability if needed. • Set up traffic and maintain instruction signs and warnings to secure safety for people and means of transport during construction. • Put speed limit signs at a distance of 200m from the construction site. • Carefully cover materials on trucks. Do not load to a height of 10cm higher than the truck body so as not to spill out and scatter materials onto roads, giving rise to dust and endangering road users. Collect spilt soils and materials at the construction site each day to avoid slippery incidents for vehicles. • Do not park vehicles in the roads longer than necessary. Do not allow construction vehicles and materials to encroach upon the pavements. • During construction near schools, deploy staff at the site to guide the traffic at the start of school time and when school is over. Water the roads to prevent dust, limit the speed of traveling trucks, do not allow flared horns, and do not dispose the waste and wastewater onto areas near schools. • Install night lighting of all construction sites. • Significant increases in number of vehicle trips must be covered in a construction plan previously approved. Routing, especially of heavy vehicles, needs to take into account sensitive sites such as schools, hospitals, and markets. • Installation of lighting at night must be done, if necessary, to ensure safe traffic circulation. • Employ safe traffic control measures, including road/rivers/canal signs and flag persons to warn of dangerous conditions. • Avoid material transportation for construction during rush hours. • Passageways for pedestrians and vehicles within and outside construction areas should be segregated and provide for easy, safe, and appropriate access. Signposts shall be installed appropriately in both water-ways and roads where necessary.	- Law No. 38/2009/QH12 dated 19/6/2009 amending and supplementing some articles of the Law relating to capital construction investment - Circular No. 22/2010/TT-BXD on regulation on construction safety		
10) Influence to Existing Infrastructure and Services	• Provide information to affected households on working schedules as well as planned disruptions (at least 2 days in advance). • The Contractor must only use vehicles of sizes and loads within permissible limits for the roads along such vehicles' route.	- Decree No. 73/2010/ND-CP on administrative penalization of violations related to security and social affairs	Contractor	PMU, CSC, IEMC

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	Supervised by
	• During the construction under power lines, deploy qualified staff to observe and give instructions to the drivers of cranes and excavators so as to avoid causing damages to power lines, telecommunications lines, etc. • Stop construction when existing works are damaged. Identify causes of related incidents and work out solutions. In case the damages are due to the Contractors' faults, the Contractors have to repair, recover, and compensate for all damages at their own expenses. The results of handling such damages must be approved by the Supervisor Engineer. • Reinstall the road surface and sidewalks at construction sites after the construction of sewer lines has been completed. • The contractor should ensure alternative water supply to affected residents in the event of disruptions lasting more than one day. • Any damages to existing cable utility systems shall be reported to the authorities and repaired as soon as possible.			
11) Social Mitigation Measures Through Worker Management	• Inform the community at least 2 weeks before commencement of the construction. In case electricity and water supplies are to be disrupted, the PMU must inform PAHs of the same at least 2 days in advance. • Employ local laborers for simple tasks. Instruct workers on environmental issues, safety and health before construction tasks are assigned. It is advisable to communicate to migrant workers on local customs, practices and habits in order to avoid conflicts with local people. • The subproject owner and contractor are to cooperate closely with the local government in performing effective community sanitation in case of epidemic symptoms breaking out in the area. • The subproject owner and contractor are to cooperate with local authorities in preventing and fighting against social evils. Conduct sensitization campaigns with both workers and communities on these issues, liaison with local organizations to ensure monitoring, and a grievance redress system to which the community can refer to. • The subproject will cooperate with the local health agency in developing and implementing plans for control of diseases among workers. • Workers temporarily residing at the camps and rented houses must be registered with the local authorities for temporary residence.	- Decree No. 73/2010/ND-CP on administrative penalization of violations against security and social affairs	Contractor	PMU, CSC, IEMC

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	Supervised by
	• Provide training on issues related to social security, social evils, diseases and epidemics, prostitution and drug use, environment, safety and health, HIV/ AIDS and infectious diseases for the workers within 2 weeks since mobilization of the workers in each construction contracts which last at least 6 months. This training is mandatory. • The workers are required to comply with Code Conduct specify in construction contract • Do not hire people under 18 years of age to carry heavy objects (from 15 kg), to carry out demolition, work in construction sites, or work underwater.			
12) Control of Impacts on Physical Cultural Resources	• Do not gather materials and wastes within 20m from cultural, historical, and religious works such as temples, pagodas, churches, monuments, historic relics, etc. Water spray the construction sites next to such works. • Do not use machines generating loud noise and high vibration levels near cultural, historical, and religious works. • In case of archaeological objects being unearthed during the implementation of earthwork, all parties will conform to the following procedures: + Suspend construction operations at the place of discovery; + Preliminarily describe the area where the archaeological objects are to be unearthed; + Strictly protect the area of the discovery so as not to damage or lose moveable objects. In case the unearthed objects are moveable or sensitive ruins, provide night protection until the local authorities, the Department of Culture, Sports and Tourism or the Institute of Archaeology takes over these unearthed objects; + Inform the Supervision Engineer of the event and who in turn will immediately inform the subproject owner, the local authorities in charge of the case and the Institute of Archaeology (within 24 hours or less); + Local relevant agencies and the Vietnam National Administration of Tourism will be responsible for protecting and preserving such archaeological relics before making decisions on the next suitable formalities. The Institute of Archaeology may be needed in the preliminarily assessment of the unearthed objects. The significance and importance of such discovered objects will be assessed by different criteria related to the nature of cultural heritages; such	- Law on cultural heritage No. 28/2001/QH10; - Amended and supplemented Law on cultural heritage No. 32/2009/QH12; - Amended and supplemented Decree No. 98/2010/ND-CP	Contractor	PMU, CSC, IEMC

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	Supervised by
	criteria would include aesthetic, historical, scientific, social or economic values; + Decisions on handling such discovered objects will be made by competent levels. Such decisions can result in changes in site arrangements (e.g. when the discovered item is a cultural relic which cannot be displaced or is archaeologically important, it is necessary to preserve, recover and excavate it); + The implementation of such decision by competent agencies related to the management of discovered objects will be communicated in writing by local competent agencies; and + Only resume construction activities at the site after being permitted by the local competent agencies and the PMU in relation to safeguarding such relics			
13) Community's Safety and Health	• The Contractor will have to conform to regulations in Circular No. 04/2017/TT-BXD by the Ministry of Construction on safety in construction. • The subproject owner and contractor are to cooperate closely with the local government in performing effective community sanitation in case of epidemic symptoms breaking out in the area. • The subproject owner and contractor are to cooperate with local authorities in preventing and fighting against social evils. • Fence of excavation pits and open channels and make off with luminous cordon and warning signs. Provide sufficient lighting when carry out construction at night. • Limit the speed of transport means to 20km/h within 200m from the construction site so as to minimize dust and noise. • Keep noise-generating machines and vehicles at such suitable distances that noise transmitted to residential areas will not be higher than 70dBA. • Use static compacting when the road base is constructed near areas with many households and weak temporary works to restrict vibration. • The subproject will cooperate with the local health agency in developing and implementing plans for control of diseases among workers.	- Circular No. 04/2017/TT-BXD regulation on construction safety - TCVN 5308-91: Technical regulation on construction safety - Decision No. 96/2008/QD-TTg on clearance of UXOs	Contractor	PMU, CSC, IEMC
14) Workers' Health Safety	• Train workers on issues related to environment, safety and health, thus enhancing their awareness of HIV/AIDS and infectious diseases within 2 weeks prior to the commencement of packages with construction items lasting at least 6 months.	- Decree No. 04/2017/TT-BXD on regulation of construction safety;	Contractor	PMU, CSC, IEMC

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	Supervised by
	• Provide workers with and request them to use adequate safety gear such as masks, helmets, shoes/boots, goggles, etc. depending on job characteristics. • Safely install power lines at offices and in construction sites and do not lay connectors on the ground or water surface. Electric wires must be with plugs. Place outdoor electric panels in protection cabinets. • Limit the speeds of vehicles traveling inside construction sites to be 5km/hour. • Provide fire-extinguishers, first-aid bags, and medical cabinets with sufficient medicines for treating general diseases in the locality must be provided at construction sites. • Safely store fuels and chemicals in areas with impermeable ground with roofs and surrounding banks, equipped with safety warning signs located at least 20m from the camps and at the end of prevailing winds. • In case of chemical and fuel leakage, the following steps will have to be taken: • Immediate check must be carried out to detect any possible case of injury. In case of injury, first-aid must be given and the injured person must be rushed to the nearest medical station for healthcare, and at the same time the case must be informed to the Supervision Engineer and the PMU; • Carry assessment to determine the kind of leaking/overflowing fuel/chemical; • Do not flush overflowing chemicals into drainage systems. Send staff with suitable safety gear to the site to handle the leakage by scattering sawdust (in case of small volumes of leaks/overflow) or sand (for high volumes of leaks/overflow). Use shovels to remove the surface soil layer if the leakage/overflow takes place on vacant land; and • Subsequent to the occurrence of such incident or accident, the Contractor will have to prepare a detailed report describing the incident and performed activities and submit the same to the Supervision Engineer and the PMU for consideration and filing. Such report will also be presented to the Department of Natural Resources and Environment or functional agencies at their request. • Set up the camps with sufficient supplies of clean water, power, and sanitation facilities. There must be at least one toilet compartment for every 25 workers, with separate toilets for males and females. Workers' beds must be provided with mosquito nets so as to prevent dengue fever. Temporary tents will be unacceptable.	- TCVN 5308-91: Technical regulation on safety in construction; - Decision No. 96/2008/QD-TTg on clearance of UXOs.		

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	Supervised by
	• Clean camps, kitchens, baths, and toilets and sanitize regularly, and keep in good sanitation conditions. Provide dustbins and collect wastes daily from the camps. Clear drainage ditches around the camps periodically. • Stop all construction activities during rains and storms, or upon accidents or serious incidents.			
15) Management of Warehouses and Borrow Pits	• All borrow pit locations to be used must be previously identified in conformity with approved construction technical specifications. Sensitive sites such as scenic spots, areas of natural habitat, areas near sensitive receiving waters, or areas near water sources should be avoided. An open ditch shall be built around the stockpile site to intercept wastewater. • Retaining walls are to set up around disposal areas if necessary. • The use of new sites for stockpiling, gathering or exploiting materials necessary for construction operations must obtain prior approval from the Construction Engineer. • In case landowners are affected by the use of their areas for stockpiling, gathering or exploiting materials, such landowners must be included in the project resettlement plan. • If access roads are needed for these new sites, they must be considered in the environmental assessment report. • PMU's Environment Officer should conduct due diligence to make sure that borrow pits and quarries are legally operating by undertaking a rapid review of quarry sites to assess if operations are in compliance with Vietnamese laws and Bank requirements prior to construction. • Include the requirement that the contractors shall be required to buy materials from licensed borrow pit and quarry operators into the civil work contractual documents.		Contractor	PMU, CSC, IEMC
16) Communication to Local Community	• Open communications channels are to be maintained with the local government and concerned communities; the contractor shall coordinate with local authorities (leaders of local wards or communes, leaders of hamlets) for agreed schedules of construction operations in areas nearby sensitive places or during sensitive times (e.g. religious festival days). • Copies of Vietnamese versions of these ECOPs and of other relevant environmental protection documents shall be made available to local communities and to workers at the site.	Decree No. 167/2013/NĐ-CP regulation on sanctioning administrative violations in the field of security, order and social security; preventing and combating social discounts; fire prevention and	Contractor	PMU, CSC, IEMC

Environmental-social issues	Mitigation measures	Vietnamese regulation	Responsibility	Supervised by
	• Subproject information will be disseminated to affected parties (e.g. local authorities, enterprises and affected households, etc.) through community meetings before construction commencement. • A contact address will be provided to the community. • The community will be provided with all information, especially technical findings, in a language that is understandable to the general public and in a form convenient to interested citizens and elected officials through the preparation of fact sheets and news releases, when major findings become available during subproject phase. • Community concerns and requested information are to be monitored as the subproject progresses. • Inquiries must be responded by telephone and written correspondence in a timely and accurate manner. • Local residents must be informed about construction and work schedules, interruption of services, traffic detour routes and provisional bus routes, blasting and demolition operations, as appropriate. • Technical documents and drawings will be provided to local People's Committees, especially the sketch of construction areas and the EMP of the construction site. • Notification boards shall be erected at all construction sites providing information about the subproject, as well as contact information about the site managers, environmental staff, health and safety staff, telephone numbers and other contact information so that affected people could have a channel to voice their concerns and suggestions.	fighting; preventing and fighting family violence.		

5.1.3.2. Specific Mitigation Measures

Depending on the scope of work and type of auxiliary items of each bid package, the Contractors will be required to comply with the specific requirements described below. The CSC and PMU shall monitor the Contractor's compliance.

Demolition of Existing Infrastructures

The following measures shall be implemented in order to protect workers and the public from falling debris and flying objects:

- Set aside a designated and restricted waste drop or discharge zones, and/or a chute for safe movement of wastes from upper to lower levels;
- Conduct sawing, cutting, grinding, sanding, chipping or chiseling with proper guards and anchoring as applicable;
- Maintain clear traffic ways to avoid driving of heavy equipment over loose scrap;
- Provide all workers with safety glasses with side shields, face shields, hard hats, and safety shoes.

Workers and Workforce Management

A concern during construction phase of the project is the potentially negative impacts of the workforce interactions with the local communities. For that reason, a Code of Conduct shall be established to outline the importance of appropriate behavior, alcohol abuse, and compliance with relevant laws and regulations. Each employee shall be informed of the Code of Conduct and bound by it while in the employment of the Client or its Contractors. The Code of Conduct shall be available to local communities at the project information centers or other place easily accessible to the communities.

The Contractor is responsible for providing appropriate training to all staff according to their level of responsibility for environmental, health and safety matters.

The Code of Conduct should contain at least the following (but not limited to them):

- Compliance with applicable laws, rules, and regulations of the jurisdiction;
- Compliance with applicable health and safety requirements (including wearing prescribed personal protective equipment, preventing avoidable accidents and a duty to report conditions or practices that pose a safety hazard or threaten the environment);
- Priorities the use of local labours;
- The use of illegal substances, weapons and firearms and gambling are prohibited;
- Non-Discrimination (for example on the basis of family status, ethnicity, race, gender, religion, language, marital status, birth, age, disability, or political conviction);
- Interactions with community members with attitude of respect and non-discrimination);
- Creating nuisances and disturbances in or near communities shall be prohibited;
- Disrespecting local customs and traditions shall be prohibited;
- Smoking shall only be allowed in designated areas;
- Sexual harassment (for example to prohibit use of language or behavior, in particular towards women or children, that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate) is prohibited;
- Violence or exploitation (for example the prohibition of the exchange of money, employment, goods, or services for sex, including sexual favors or other forms of humiliating, degrading or exploitative behavior) is prohibited;

- Protection of children (including prohibitions against abuse, defilement, or otherwise unacceptable behavior with children, limiting interactions with children, and ensuring their safety in project areas);
- The workers have access to drinking water supply and appropriate sanitary facilities provided by their employer and not open areas);
- Avoidance of conflicts of interest (such that benefits, contracts, or employment, or any sort of preferential treatment or favors, are not provided to any person with whom there is a financial, family, or personal connection);
- Respecting reasonable work instructions (including regarding environmental and social norms);
- Protection and proper use of property (for example, to prohibit theft, carelessness or waste);
- Duty to report violations of this Code;
- Non-retaliation against workers who report violations of the Code, if that report is made in good faith; and
- Residing camp workforce visiting the local communities shall behave in a manner consistent with the Code of Conduct.

The Code of Conduct should be written in plain language and signed by each worker to indicate that they have:

- Received a copy of the code;
- Had the code explained to them;
- Acknowledged that adherence to this Code of Conduct is a condition of employment; and
- Understood that violations of the Code can result in serious consequences, up to and including dismissal, or referral to legal authorities.

Prohibitions. The following activities are prohibited on or near the project site:

- Cutting of trees for any reason outside the approved construction area;
- Hunting, fishing, wildlife capture, or plant collection;
- Buying of wild animals for food;
- Use of unapproved toxic materials, including lead-based paints, asbestos, etc.;
- Disturbance to anything with architectural or historical value;
- Building of fires;
- Use of firearms (except authorized security guards);
- Use of alcohol by workers during working hours;
- Gambling should be strictly forbidden.
- Washing cars or machinery in streams or creeks;
- Doing maintenance (change of oils and filters) of cars and equipment outside authorized areas:
- Disposing trash in unauthorized places;
- Driving in an unsafe manner in local roads;
- Having caged wild animals (especially birds) in camps;
- Working without safety equipment (including boots and helmets);
- Creating nuisances and disturbances in or near communities;
- The use of rivers and streams for washing clothes;
- Indiscriminate disposal of rubbish or construction wastes or rubble;
- Littering the site;
- Spillage of potential pollutants, such as petroleum products;
- Collection of firewood;
- Poaching of any description;

- Explosive and chemical fishing;
- Latrine outside the designated facilities; and
- Burning of wastes and/or cleared vegetation.

Security. Some security measures shall be put into place to ensure the safe and secure running of the camp and its residents. Some of these security measures include:

- The list of workers must be registered to local authorities in accordance with existing Vietnamese regulations
- Children under 14 years of age will hot hired under the Project
- Adequate, day-time night-time lighting shall be provided;
- Control of camp access. Access to the camp shall be limited to the residing workforce, construction camp employees, and those visiting personnel on business purposes;
- Prior approval from the construction camp manager for visitor's access to the construction camp;
- A perimeter security fence at least 3m in height constructed from appropriate materials;
- Provision and installation in all buildings of firefighting equipment and portable fires extinguishers.

Any construction worker, office staff, Contractor's employees or any other person related to the project found violating theses prohibitions will be subject to disciplinary actions that can range from a simple reprimand to termination of his/her employment depending on the seriousness of the violation.

Workers Camps

Workers' Camp and Site Installation Requirement. Potential sites of workers'camps were discussed with and proposed by local communities and authorities during consultations. Construction camp sites will have to be approved by local authorities and agreed with local communities prior to their establishment. If additional camps and ancillary construction sites are selected, for following criteria must be used:

- Construction sites, including asphalt stations as well as construction camps will minimize the land occupation by setting them at the interchange areas where relatively large areas of land will be needed eventually.
- Site offices shall be located at least 200 meters from any existing residential settlements. Camp facilities should not be located in steep slopes;
- Site offices, camps be located at least 100 meters from any watercourses and be operated so that no pollutants enter watercourses. Camp areas shall be located to allow effective natural drainage;
- All construction camps shall be zoned according to their use. For example, workers' camp zone, sanitary facilities, offices, etc.
- The workforce shall be provided with safe, suitable and comfortable accommodations. They have to be maintained in clean and sanitary conditions;
- In every site adequate and suitable facilities for washing clothes and utensils shall be provided and maintained for the use of contract labor employed therein;
- Potable water for human consumption shall be provided for at camps, site offices, medical facilities, and other areas. Potable water shall follow the National Standards for Drinking Water Quality, and the other municipal water will be in accordance with class A1 of QCVN 08-2008/BTNMT - National technical regulation on surface water quality.

- The camp can be characterized as a housing estate, and the water quota could refer to class A1 QCVN 08-2008/BTNMT - National technical regulation on surface water quality.
- Drainage, wastewater treatment and solid waste disposal of the construction site shall follow national regulations and the mitigation measures presented in the Contractor's Waste Management Plan.

Sanitary Facilities. In every camp site separate and adequate lavatory facilities (toilets and washing areas) shall be provided for the use of male and female workers. Toilet facilities should also be provided with adequate supplies running water, soap, and toilet paper. Such facilities shall be conveniently accessible and shall be kept in clean and hygienic conditions;

- Where workers of both sexes are employed, there shall be displayed outside each block of latrine and urinal, a notice in the language understood by the majority of the workers "For Men Only" or "For Women Only" as the case may be;
- Sanitary arrangements, latrines and urinals shall be provided in every work place on the following scale: Where female workers are employed, there shall be at least one latrine for every 25 females or part thereof; Where males are employed, there shall be at least one latrine for every 25 males or part thereof;
- At every construction camp, there must be at least one septic tank. The wastewater from the tank shall not be discharged into any watercourses. The wastewater shall be periodically transported away by a water tank to the nearest treatment plant;
- Sewage tanks shall be designed and installed by the Contractor(s) in accordance with the National Design Code for construction of camps.

Medical Facilities. A medical and first aid kit shall be provided at each camp area. All consumables in the first aid kit should be checked and recharged regularly.

Earthworks, Cuts and Fill Slopes Management

Earthworks, cuts and fill slopes shall be carefully managed to minimize negative impacts on the environment

- All earthworks shall be properly controlled, especially during the rainy season.
- The Contractor shall maintain stable cut and fill slopes at all times and cause the least possible disturbance to areas outside the prescribed limits of the works.
- The Contractor shall complete cut and fill operations to final cross-sections at any one location as soon as possible and preferably in one continuous operation to avoid partially completed earthworks, especially during the rainy season.
- In order to protect any cut or fill slopes from erosion, in accordance with the drawings, cut off drains and toe-drains shall be provided at the top and bottom of slopes and be planted with grass or other plant cover. Cut off drains should be provided above high cuts to minimize water runoff and slope erosion.
- The Contractor shall use the excavated material from for filling unless the CSC consider the material unsuitable for filling;
- Any excavated cut or unsuitable material shall be disposed of in designated disposal areas as agreed to by the CSC;

5.1.3.2. Site- Specific Mitigation Measures

Stockpiles, Quarries and Borrow Pit

Existing borrow pits or quarries located near the project area will be used. However, in case that new borrow pits and quarries are needed, the Contractor shall carry out the following activities:

- Locations of stockpiles, quarries and borrow pits shall be identified and demarcated, ensuring that they are far away from critical areas such as steep slopes, erosion-prone soils, cultivated lands, and areas that drain directly into water bodies. Locations of stockpiles, quarries and borrow pits shall be in non-productive land to the maximum extent possible and be approved by DONRE, PMUs the ECO;
- Location of stockpiles, quarries, and borrow pits shall avoid sensitive areas such as nature reserves, scenic spots, forest parks, water source protection areas, etc;
- An open ditch shall be built around the stockpile site to intercept wastewater;
- Limit extraction of material to approved and demarcated quarries and borrow pits;
- Stockpile topsoil when first opening the borrow pit. After all usable borrow has been removed, the previously stockpiled topsoil should be spread back over the borrow area and graded to a smooth, uniform surface, sloped to drain. On steep slopes, benches or terraces may have to be specified to help control erosion;
- Excess overburden should be stabilized and re-vegetated. Where appropriate, organic debris and overburden should be spread over the disturbed site to promote re-vegetation. Natural re-vegetation is preferred to the extent practicable;
- Existing drainage channels in areas affected by the operation should be kept free of overburden;
- Prior to the initiation of construction, the materials stockpiles shall be constructed with peripheral storm water drains and interception ditches to divert storm water into rivers downstream, in order to avoid direct erosive impact from storm water. If necessary, sedimentation ponds will also be constructed to remove sands and other solids in storm water before it reaches the rivers downstream.
- The design document indicates that the largest percentage of spoils will be rocks and stones. Thus, in order to reclaim the stockpiles after dumping of spoils is completed, the top soil shall be removed before the site is cleared. The top soil will be placed on a corner of the disposal site. The location and pile structure will be taken into consideration for erosion control. The interception ditches and sedimentation ponds in the disposal sites will also be used to control loss of top soil due to erosion;
- The Contractor shall ensure that all borrow pits used are left in a trim and tidy condition with stable side slopes, re-establishment of vegetation, restoration of natural water courses, avoidance of flooding of the excavated areas wherever possible so no stagnant water bodies are created which could breed mosquitoes;
- When the borrow pits cannot be refilled or reasonably drained, the Contractor shall consult with the local community to determine their preference for reuse such as fish farming or other community purposes;
- No foreign material generated/ deposited during construction shall remain on site;
- Areas affected by stockpiling shall be reinstated to the satisfaction of the CSC.

Spoil Disposal Sites

If the Contractor proposes any new sites as disposal sites during the construction phase, they have to be approved by PMU and relevant local authorities. The contractor should ensure that these sites (a) are not located within designated forest or cultivated areas, or any other properties; (b) do not impact natural drainage courses; and (c) where they can cause future slides, (d) do not impact endangered/rare flora. Under no circumstances shall the contractor dispose of any material in environmentally sensitive areas. The final use of the disposal site shall be approved by the local government.

Besides the requirements for the location of spoil disposal sites, the following actions shall be put into place:

- Land owners shall be compensated if farmland is occupied for disposal sites;
- Before the commencement of the disposal operation, 30 cm of natural soil from the surface shall be first removed and stored at the site. This material will be reserved and used at the end of the disposal operation as cover material for the rehabilitation of the disposal site.
- If the disposal site would be located near a river or water course, a retaining wall and/or interception ditch or settling ponds shall be built prior to the initiation of the construction activities. The surface runoff shall be retained and settled first before allowed discharge into the receiving water;
- To ensure the stability of the spoil disposal site, the mortar rubble masonry pavement and grouted rubble toe protection shall be adopted to prevent erosion and maintain stability.
- A drainage ditch shall be built around the disposal site to control surface runoff;
- The construction of disposal sites and transportation of spoils at night is strictly prohibited near residential areas. The sites shall be watered for dust suppression during their operation;
- Disposal sites close to patches of agricultural land will be limited in size to avoid damages to crops;

Construction of New Bridges

- The bridge works shall be scheduled to avoid the high river flow season;
- Descriptions on measures for spill prevention, and sedimentation control, surface water flow diversion, reinstatement, etc.
- Local authority and community shall be informed about the construction works the existing bridge with at least two weeks' notice.
- Equip life jackets, safety belts, ear plugs to workers when building bridge over a river or streamline.
- Signboards and fences shall be placed and maintained to safely block off access to the two ends of the existing bridge. Allocate staff to guard the site 24 hours per day. Ensure adequate lighting at night time.
- Life vests and protective equipment are provided to the workers and enforce the use when working in or above water surface, especially during construction of bridge abutments (2-3m high above the water surface);

- For bridge construction, the waste shall be controlled strictly to restrict discharge or dumping of any wastewater, slurry, waste, fuels and waste oil into the water. All these materials must be collected and disposed of on land at the banks. The slurry and sediment shall also pump to the banks for disposal and shall not be allowed to discharge to the rivers directly;
- After bridge construction, the works area shall be reinstated.
- Concrete mixing directly on the ground shall not be allowed and shall take place on impermeable surfaces;
- All runoff from batching areas shall be strictly controlled, and cement-contaminated water shall be collected, stored and disposed of at the approved site;
- Unused cement bags shall be stored out of the rain where runoff won't affect it; Used (empty) cement bags shall be collected and stored in weatherproof containers to prevent windblown cement dust and water contamination.;
- All excess concrete shall be removed from site on completion of concrete works and disposed of. Washing of the excess into the ground is not allowed. All excess aggregate shall also be removed.
- In the course of bore pile driving, the use of bentonite must be conducted inside a cofferdam made of earth or steel to prevent any spillage from overflowing into the environment and all the mixture of soil and bentonite and bentonite spilled over must be collected and the following forms of processing any spillage are recommended
- Construction of bridge pier (abutments) on land: spillage of mixture of soil and bentonite although liquefied and bentonite will be primarily handled: Waste solution of bentonite will be collected into a collector drain, sump or cistern to avoid direct discharge within the construction site, then it will be deposited, preliminary dried and transported for disposal at a designated location either for recycling or recovering the bentonite;
- Construction of piers adjacent to the flow: soil mixed with bentonite, even liquefied, and spilled bentonite will be either moved to storage yards on the shore or placed in containers for depositing or drying and then transported to indicate waste dumps for recycling and recovering the bentonite.
- For any in water construction for bridges, there shall be strict waste control plan to restrict discharge or dumping of any directly discharge of wastewater, slurry, waste, fuels and waste oil into the water. All these materials must be collected and disposed at the banks. The slurry and sediment shall also pump to the banks for disposal and shall not be allowed to discharge to the rivers directly;
- Reinstatement of watercourse crossings shall be carried out, including generic methods for all watercourse crossings and site-specific methods statements for significant or sensitive watercourse crossings;
- After bridge construction, the works area, stream diversion, settlement pond areas and temporary bypasses shall be reinstated to the satisfaction of the ECO and SES.

5.1.3.3. Site-specific Mitigation Measures

The relevant site-specific mitigation measures listed in Table 71 will be included into construction bidding and contractual documents of each bid package

Table 71: Site-specific Mitigation Measures during the Rehabilitation of Thuy Son lake (in dry season)

Picture on Current Status	Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
	The Thuy Son lake has been heavily sedimented, there is only stagnant water in dry season when dredging would take place. The rehabilitation of Thuy Son lake will generate 28,500 m3 of excavated and dredged materials. This volume of materials will occupy certain land areas for both temporary loading and permanent disposal. There are some shops, a school, a hotel and a small existing 22Kv power station poles and lines, and four roads surrounding the lake.	- Traffics disturbance and increased traffic safety risk due to dropping of material from trucks; - Bad odor released from dredged/ excavated materials; - Increased dust levels from granular temporary loaded materials; - Disturbance to the businesses of the hotel and shops near the lake - Increased safety and traffic safety risks, particularly in the section near the school; - Safety risks for local residents, school children, hotel guests and the workers; - Nuisance for the public; - **Negative impacts on urban landscape from temporary material and waste loads;**	- Inform local residents, school and hotel managements at least two weeks before construction commencement - Place the entrance gate to construction site on Le Quang Tri road side. - Provide adequate lighting at night - Set up 3m-high fences around the construction site of the Thuy Son lake - Install wheel washers at the construction site gate - Place sign boards on the road signs, limited speed 10 km / h, drivers are required to observ while traveling on the NH 1A segment next to the lake - Only load temporary materials excavated / dredged within the lake, not on the footpath or road - Transport the excavated material away from the site as soon as possible - Trucks carrying excavated materials must be fully covered before leaving the lake -

Picture on Current Status	Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
 Within the lake area	- The bottom of the lake is heavily sediment, the volume of material dredge relatively large - The lake is dry in dry season, only stagnant water - There are four roads surrounding the lake	- Injury risk for worker when carrying out manual work on the bottom of the lake (insect bites, walked on broken materials etc.) - Some insects, reptiles may be disturbed or killed - Safety risks for local residents, school children if they enter excavation area;	- Request school management to forbid the children to enter construction area - Place signboards to restrict unauthorized access to construction site - Do not load materials and wastes on the footpath or on the road, tidy up the footpath and the road daily - Provide adequate protective cloths, particularly boots and gloves for the workers and enforce the use. - If insects are detected, try to drive them away or catch and release to another undisturbed area instead of killing them.
 **Song Tri primary school** 	- Song Tri primary school facing the lake on Le Quang Chi road	- Noise from the truck, car horn distracts teaching and learning activities - Increased traffic safety risks during school opening and closing hours - Accident risk for students if entering the construction area - Odor and dust from dredged material. - Negative impact on landscape.	- Set up 3m-high solid fences around the construction site of the Thuy Son lake. Place sign board on the fence in front of school. - Inform school managers at least one week in advance. - Avoid activities generating high noise during school hours in December and May (exam season). - Install speed limit at 5km/h sign at the two ends of the section - Arrange staff to direct traffic at school opening and school over time at sections in front of the school - Transport the excavated material away from the site as soon as possible

Picture on Current Status	Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
 **Bao An hotel**	Bao An Hotel on Le Quang Chi Street. There are existing electrical pole and wires along the road perpendicular to the hotel. 30m from lake	- Nuisance to hotel guests - Negative impacts on urban landscape related to temporary materials and waste dumps - Dust from granular materials - Obstruct the hotel guest's walk - Increased traffic safety risks - Electrical poles and wires may be damaged, power supply service may be disrupted.	- Inform hotel managers at least one week in advance. - Raise the power lines to ensure clearance at the gate is adequate for trucks and other construction plan to move safely underneath. - Install speed limit at 5km/h sign at the two ends of the section - Arrange staff to direct traffic at hotel entrance when there are trucks moving in/out construction site. - Do not load materials and wastes within 50 m from hotel, on the road - Tidy up the road and footpath within 50m from construction site entrance daily. - Water the road, in hot, dry, windy weather.
A road in front of Bao An hotel 	A road in front of Bao An hotel with sidewalk, power pole and wire, some trees		
	- There is a 22Kv power station at the intersection of Le Quang Chi and NH1	- Worker safety risk related to this station. - Increased traffic safety risks - Construction machines such as excavators, bulldozers may cause damage to the power station and lines	- Install speed limit at 5km/h sign at the two ends of the section - Arrange staff to direct crane drivers when working near the gate or near power lines/poles.

Picture on Current Status	Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
	- This is the intersection between NH 1A and Le Quang Chi road. There is some power poles and wires at this section.		

Table 72: Site-specific Mitigation Measures for Lining of Tri River Embankment

Location	Picture on Current Status	Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
Left bank		- The river banks have not had solid embankment or embankment with low crest (from +2.5m to +3.0m) so the dam discharge with huge water amount exceeding the river capacity, causing local flooding on both sides of the river (many of which are		

Location	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
			flooded from 0.5m to 1.0m)		
	 **Km0+000 to Km0+500**	 **Km0+000 to Km0+500**	Start point - Currently the embankment side is covered with grass and shrubs. - There is no residential houses in this area. - There is the existing ditch in this section.	Start point - Loss of vegetation cover and some trees - Risk of accidents for workers caused by insects such as ants, bees, spiders, snake bites when building near the bush - Irrigation service may be disrupted if the ditch is blocked. - Drowning accident risk.	- Build compensatory ditch before construction. - Clean up the ditch nearby construction site regularly. - Do not load materials, wastes and machines on vegetated land outside construction areas. - Provide adequate protective cloths for the workers and enforce the use - If insects are founded, try to drive them away or catch and release to another undisturbed area instead of killing them. - Include rules about not swimming in the river. Place a drowning warning sign at the construction site.
	 **Km0+500**	 **Km0+500**	Km0+500 - Most of the vegetation covered with shrubs. There are some trees. - This area is away from residential areas.		
	 **From Km0+500 to Km1+085**	 **From Km0+500 to Km1+085**	Km1+085 - The land being used for short-term crops (permanently acquired before construction) and vacant bush land. - This area is away from residential areas.	Km1+085 - Over clearance of existing vegetation cover. - Risk of accidents for workers caused by insects such as ants, bees, spiders, snake bites when building near the bush	- Marking the boundary of site clearance area to avoid over clearance of vegetation cover and trees. - If insects are founded, try to drive them away or catch and release to another undisturbed area instead of killing them - Provide adequate protective cloths for the workers and enforce the

Location	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
					use, particularly gloves, boots and hats.
	 **From Km1+085 to Km1+200**	 **From Km1+085 to Km1+200**	Km1+200 - This section has existing embankments and concrete roads. People live scatterly along this section. The houses are about 5-10m from the road (about 15 houses and restaurants).	Km1+200 - Temporary loaded materials generate bad odor causing nuisance to the public, affecting landscape. - Wastewater generated from temporary loaded dredged material may cause localize flooding. - Reduced access to watersurface by local people - Materials and construction plants obstruct access to houses and shops at riverside, affect their incomes - Disturbance to daily life and movement of local people. - Increased safety traffic safety risk - Trees in front of houses may be damage by construction plants	- Inform local community at least two weeks before construction. - Negotiate with local resident about temporary loading of dredged materials. - The dry dredged materials should be transported away as soon as possible in covered trucks. - Do not load materials and wastes on the road, tidy up the sites daily - Provide temporary access to houses and shops when access is disrupted - Provide adequate lighting at night time - Install fence with reflective bands (where space is sufficient). - Inform businesses at least one week before construction commencement - Install sign surround affected areas surrounding construction areas

Location	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
	 **From Km1+200 to Km1+500**	 **From Km1+200 to Km1+500**	The end point is the intersection between the existing road along the Tri river and NH1. Next to the intersection is a shop and a notary office.	- Increased traffic safety risks at the intersection with NH1 when trucks moved from the riverside road (lower elevation) to the NH1 (higher elevation) with limited vision.	- Inform businesses at least one week before construction commencement - Install sign surround affected areas surrounding construction areas - Provide adequate lighting at night time - Do not load materials and wastes on the road, tidy up the sites daily
Right bank	 **From Km0+000 to Km0+650**	 **From Km0+000 to Km0+650**	Start point - This section is vacant land covered with grass. - The section is 1.5km long. There is no existing road but only earthen path to agricultural land. There are some bushes and tall trees as riverside - The nearest residential's house is 60m from the river bank.	Start point - Over clearance of vegetation cover - Risk of accidents for workers caused by insects such as ants, bees, spiders, snake bites when building near the bush or being drown in the river. - The accessibility to agricultural land on this existing path may be disturbed.	- Marking the boundary of site clearance area to avoid over clearance of vegetation cover and trees - Do not load materials, wastes and machines on vegetated land outside construction areas. - Provide adequate protective cloths for the workers and enforce the use, particularly gloves, boots and hats - Include rules about not swimming in the river. Place a drowning warning sign at the construction site.

Location	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
	 **Km0+650**	 **Km0+650**	Km0+650 There are shrubs and some 1.5m tall trees on riverside.		- Provide/maintain alternative access to agriculture land.
	 **From Km0+650 to Km 1+100**	 **From Km0+650 to Km 1+100**	Km 1+100 - There are no roads and mainly agricultural land. The bank of the river is the shore, there are many shrubs and some tall trees.	Km 1+100 - Dredged materials and wastewater may pollute crop land - Irrigation ditch may be blocked. - Disturb agricultural production activities - Over clearance of vegetation cover - Risk of accidents for workers caused by insects such as ants, bees, spiders, snake bites when building near the bush or being drown in the river	- Build compensatory ditch before construction. - Clean up the ditch nearby construction site regularly - Avoid temporary loading of materials and wastes near crop land, levelling the materials as soon as possible - Provide/maintain safe and convenient access to agriculture land for farmers. - Arrange workers to assist the farmers when they transport materials/products nearby construction area - Marking the boundary of site clearance area to avoid over clearance of vegetation cover and trees

Location	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
					- Do not load materials, wastes and machines on vegetated land outside construction areas. - Provide adequate protective cloths for the workers and enforce the use, particularly gloves, boots and hats
	 **From Km1+100 to Km 1+300**	 **From Km1+100 to Km 1+300**	Km 1+300 - This section has existing embankments and concrete roads. People live about 60 meters from the concrete road.	Km 1+200 - Temporary loaded materials generate bad odor causing nuisance to the public, affecting landscape. - Wastewater generated from temporary loaded dredged material may cause localize flooding. - Reduced access to watersurface by local people - Disturbance to daily life and movement of local people. - Increased traffic safety risk - Trees in front of houses may be damage by construction plants	- Inform local community at least two weeks before construction. - Negotiate with local resident about temporary loading of dredged materials. - The dry dredged materials should be transported away as soon as possible in covered trucks. - Do not load materials and wastes on the road, tidy up the sites daily. - Install sign surround affected areas surrounding construction areas. - Provide adequate lighting at night time.
	 **From Km1+300 to Km1+500**	 **From Km1+300 to Km1+500**	- The end point is the intersection between the existing road along the Tri river and NH1.	- Increased traffic safety risks at the intersection with NH1 when trucks moved from the riverside road to the NH 1A - Materials and construction plants obstruct access to houses and shops nearby the intersection, affect their incomes	- Inform businesses at least one week before construction commencement - Install fences and sign surround disturbed areas to separate construction areas - Provide adequate lighting at night time - Ensure adequate lighting at nigh

Location	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
					- Do not load materials and wastes on the road, tidy up the sites daily.

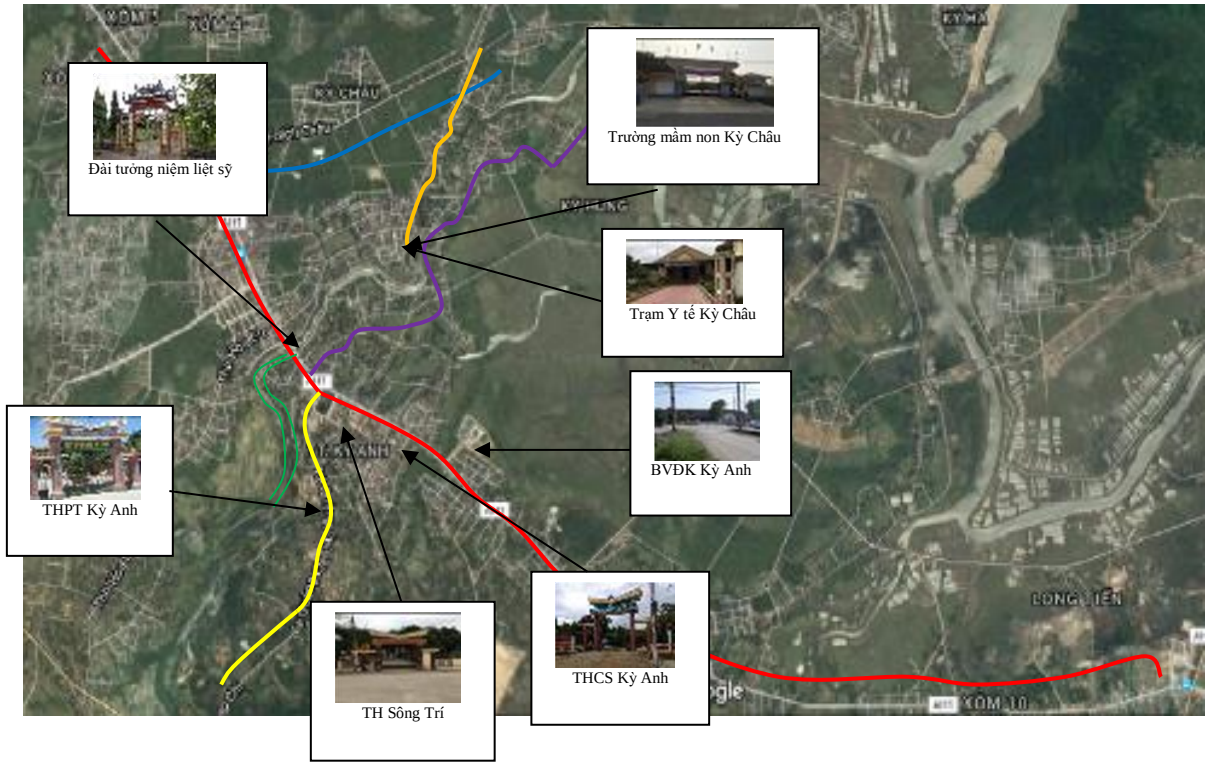
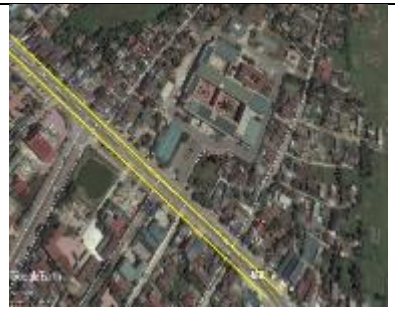


Figure 42: Sensitive Locations on the Route for Waste Transportation and Dumping

Table 73: Site-specific Mitigation Measures for Main pipeline

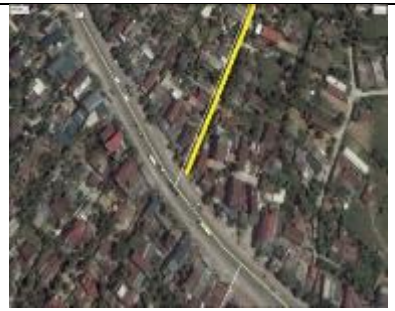
Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts and Risks	Site-specific Mitigation Measures
NH 1A	 **Start of the route, Km 0+000**	 **Start of the route, Km 0+000**	- Pipeline runs along the road, there is rainwater drainage system, population density is sparse, the distance from the house to the edge of the road is 5 - 10m. - Grass cover at roadside - there is an existing drainage, - population density is sparse	- Traffic safety risks at the intersection of the route - Disrupt access to roadside houses and shops for construction - Materials, construction waste may fall into and block the existing drainage ditches - The vegetation cover will be disturbed, partially removed	- Inform businesses at least one week before construction commencement - Install "slow down" and "road work" as the two end of construction area. - Provide adequate lighting at night time - Do not load materials and wastes on the road, vegetated land outside construction areas. - Tidy up the sites daily. - Provide temporary access to houses and shops when access is disrupted - Maintain drainage function of the existing ditch.
	 **Km 0+750**	 **Km 0+750**	- The pipeline built on siphon parallel to Ngay bridge. - There are some houses located 5-10m from the road edge.	- Increased traffic safety risks at the two ends of bridge - Dust, noise and disturbance to roadside houses - Obstruct access of households living along the road - Safety risks for workers when working at height and on water surface - Safety related to the use of electricity for welding.	- Inform businesses at least one week before construction commencement - Install "slow down" and "road work" as the two end of construction area. - Provide adequate lighting at night time - Tidy up the site regularly - Water the road section passing residential houses in dry weather - Collect and clean up materials and waste dropped on the road - Provide temporary access to houses when access is disrupted - Provide lifevest and belts, hard hats and force the workers to use - Requires workers to wear full protective clothing when welding

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts and Risks	Site-specific Mitigation Measures
	 **Km 0+830**	 **Km 0+830**	- - Km 0+830: - The right-hand pipeline runs adjacent to the no name temple about 5m - There are power posts and wires on the roadside and crossing the road - There are green trees along the road 3-5m away from the sewer - There is a house 5-10m far from the sewer	- Impact on the landscape in front of the temple. - The power post and lines may be damaged by excavators / cranes - The trees may be damaged by excavators / cranes - Obstruct access to the houses, shops along the road - Dust, noise and safety risks to roadside houses	- Do not load materials and wastes 20m from the temple, tidy up the sites daily - Arrange staff to direct the drivers when cranes, bulldozers, trucks are working within 10 m from power poles/lines. - Allocate staff to instruct crane drivers to avoid trees, - Request the workers to avoid damages to tree branches when carrying out manual works - Provide temporary access to houses and shops when access is disrupted - Water the road section passing residential houses in dry weather - Collect and clean up materials and waste dropped on the road
	 **Km 1+930**	 **Km 1+930**	- The pipeline passes through sub-zone 4, Hung Thinh residential cluster in Song Tri ward. - The distance from the house to the edge of the road is 5 - 10m	- Increased traffic safety risks - Obstruct access to roadside houses - Dust, noise and safety risks to the residents in roadside houses -	- Inform businesses at least one week before construction commencement - Install “slow down” and “road work” as the two end of construction area. - Provide adequate lighting at night time - Do not load materials and wastes on the road, tidy up the sites daily - Provide temporary access to houses when access is disrupted - Water the road section passing residential houses in dry weather - Collect and clean up materials and waste dropped on the road

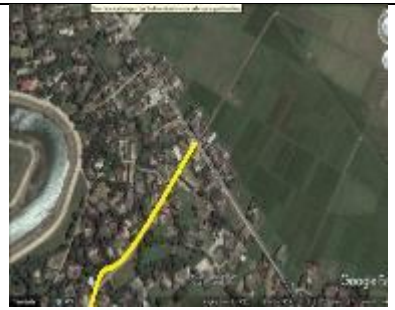
Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts and Risks	Site-specific Mitigation Measures
	 **Km 3+290**	 **Km 3+290**	- - Km 3+290: The pipeline passes through sub-zone 2, Hung Hoa residential cluster in Song Tri ward. The distance from the house to the edge of the road is 5 - 10m. This section is quite populated. - Electrical running above along footpaths at both sides	- Impacts on urban landscape related to temporary loading of waste and bulky materials - Disruption or damage to existing facilities such as water pipes, power and telecommunication cables, etc. - Disturb, interrupt the business of roadside shops - Damages to roadside electrical trees, wires and poles.	- Inform community at least two weeks before construction commencement. - Build temporary drains along the alignment - Provide temporary access to roadside shops and houses. - Load materials and wastes tidily, - Remove the wastes from construction sites on daily basis - Arrange staff to direct the drivers when cranes, bulldozers, trucks are working within 10 m from trees/power poles/lines.
	 **Km3+650**	  **Km3+650**	- Km 3+650: the right-hand pipeline passes through Ky Anh General Hospital about 0-5m. - Trees, electrical poles and wires at roadside.	- Safety risks for the patients and doctors when present near the gate of the hospital particularly at night time, rush hours, during the handling of bulky items such as pre-casted pipes - Dust and noise disturb, affect the patients in the hospital - Damages to roadside electrical wires, poles and trees	- Inform community at least two weeks before construction commencement. - Install “slow down” and “road work” as the two end of construction area. - Provide adequate lighting at night time. - Do not load materials and wastes on the road, tidy up the sites daily. - Avoid activities generating high noise between 10 pm and 6 am - Water the road, particularly excavation area, in hot, dry, windy weather - Arrange staff to direct the drivers when cranes, bulldozers, trucks are

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts and Risks	Site-specific Mitigation Measures
					working within 10 m from power poles/lines/trees
	 **Km4+050**	 **Km4+050**	- Km 4+050: Although not passing, the pipeline is 50m from Song Tri Primary School. - Electrical wires hang over head.	- Traffic disturbance and increased traffic safety risks affecting students - Accident risks for students relate to open trenches - Damages to electrical wires and poles. - Dust and noise affect - Roadside trees may be damaged	- Inform school managers at least one week in advance. - Install speed limit at 5km/h sign at the two ends of the section - Arrange staff to direct traffic at school opening and school over time at sections in front of the school. - Install fence and warning signs open holes, channels - Do not load materials and wastes within 50 m from school gates - Do not load or unload materials during rush hours - Water the disturbed areas in hot and dry days
	 **Km4+710**	 **Km4+710**	- Km 4+710: The pipeline built on siphon parallel to Tri bridge.	- Increased traffic safety risks at the two ends of bridge - Dust, noise and disturbance to roadside houses - Obstruct access of households living along the road - Safety risks for workers when working at height and on water surface - Safety related to the use of electricity for welding.	- Inform businesses at least one week before construction commencement - Install “slow down” and “road work” as the two end of construction area. - Provide adequate lighting at night time - Tidy up the site regularly - Water the road section passing residential houses in dry weather - Collect and clean up materials and waste dropped on the road - Provide temporary access to houses when access is disrupted - Provide lifevest and belts, hard hats and force the workers to use

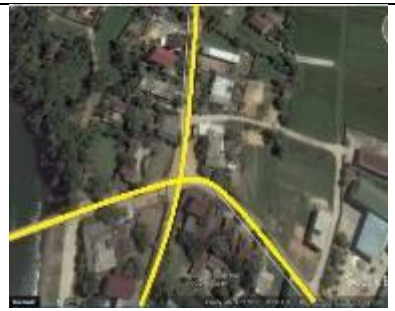
Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts and Risks	Site-specific Mitigation Measures
					- Requires workers to wear full protective clothing when welding
	 **Km4+890**	 **Km4+890**	- Km 4+890: The right-hand pipeline passes the memorial (7 m from the road) martyr of Song Tri ward. - Some trees on the footpath - Houses close to the road - Electrical wires along the road	- Traffic disturbance or interruptions - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Impacts on landscape in the area near the memorial - Trees may be affected or damaged - Electrical wires and poles may be damaged	- Install warning signs and signboards - Arrange staff to direct traffic in rush hours - Provide temporary access to houses and shops when access is disrupted - Schedule construction of the section passing the memorial to avoid the Memorial Day. - Do not load materials and wastes within 50 m from the memorial gates. - Allocate staff to instruct crane drivers to avoid trees. - Request the workers to avoid damages to tree branches when carrying out manual works - Allocate staff to instruct crane drivers to avoid poles and wires.
	 **Km5+550**	 **Km5+550**	- Km 5+550: the pipeline passes through Viet-Lao 3-way intersection. - Electrical wires along the road	- Traffic disturbance or interruptions, increased traffic safety risks. - Urban landscape related to temporary loading of waste and bulky materials. - Trees may be affected or damaged. - Electrical wires and poles may be damaged	- Inform community at least two weeks before construction commencement. - Install “slow down” and “road work” as the two end of construction area. - Provide adequate lighting at night time. - Do not load materials and wastes on the road, tidy up the sites daily. - Do not load materials and wastes within 50m from the residential houses.

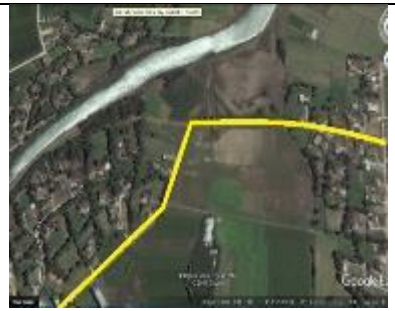
Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts and Risks	Site-specific Mitigation Measures
					- Arrange staff to direct traffic in rush hours - Allocate staff to instruct crane drivers to avoid trees, poles and wires.
	 **End of the route (km 6+00)**	 **End of the route (km 6+00)**	- - Km 6+00: At the end of the collection pipeline along NH1A, at Ky Anh town post office. - Electrical wires along the road. - There are some trees at roadside.	- Traffic disturbance or interruptions - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shop - Electrical wires and poles may be damaged - Trees may be affected or damaged	- Inform community at least two weeks before construction commencement. - Install "slow down" and "road work" as the two end of construction area. - Provide adequate lighting at night time. - Provide temporary access to houses and shops when access is disrupted - Allocate staff to instruct crane drivers to avoid trees, poles and wires.
Ky Hung communal main road	 **Km 0+000**	 **Km 0+000**	- Pipeline characteristics: The pipeline runs along the main road of Ky Hung commune, some sections have rainwater drainage sewers, the population density is moderate, the distance from the house to the edge of the road is 0 - 5m. - There are some trees, electrical	- Traffic disturbance or interruptions - Impacts on Urban landscape related to temporary loading of waste and bulky materials - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Trees may be affected or damaged - Electrical wires and poles may be damaged	- Avoid construction activities at night time. Incase not avoidable, inform community at least two weeks. - Install fence with reflective band, warning signs and signboards around open trenches. - Provide adequate lighting at night time. - Arrange staff to direct traffic in rush hours, to instruct crane drivers to avoid trees, poles and wires. - Do not load material and waste within 20m from shop. Transport materials/ wastes away as soon as possible. - Water the road in hot, dry day and clean up the site daily.

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts and Risks	Site-specific Mitigation Measures
			poles and wires at roadside		- Build temporary drains along the alignment - Minimize temporary loading of materials and wastes, levelling the materials as soon as possible - Arrange staff to direct during the loading/unloading in rush hours - Provide temporary access to houses and shops when access is disrupted
	 **Km 0+760**	 **Km 0+760**	- Km 0+760: The pipeline runs along the main road of Tan Ha hamlet in Ky Hung commune, some sections have rainwater drainage sewers, the population density is moderate, the distance from the house to the edge of the road is 0 - 5m. - There are some trees, electrical poles and wires at roadside	- Traffic disturbance or interruptions - Impacts on Urban landscape related to temporary loading of waste and bulky materials - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Trees may be affected or damaged - Electrical wires and poles may be damaged	- Avoid construction activities at night time. Incase not avoidable, inform community at least two weeks. - Install fence with reflective band, warning signs and signboards around open trenches. - Provide adequate lighting at night time. - Arrange staff to direct traffic in rush hours, to instruct crane drivers to avoid trees, poles and wires. - Do not load material and waste within 20m from shop. Transport materials/ wastes away as soon as possible. - Water the road in hot, dry day and clean up the site daily.

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts and Risks	Site-specific Mitigation Measures
	 **Km 1+000**	 **Km 1+000**	- Km 1+000: The pipeline runs along the main road of Tan Ha hamlet in Ky Hung commune, some sections have rainwater drainage sewers, the population density is moderate, the distance from the house to the edge of the road is 0 - 5m. - There are some trees, electrical poles and wires at roadside		- Build temporary drains along the alignment - Minimize temporary loading of materials and wastes, levelling the materials as soon as possible - Arrange staff to direct during the loading/unloading in rush hours - Provide temporary access to houses and shops when access is disrupted
	 **Km 1+300**	 **Km 1+300**	- Km 1+300: The pipeline runs along the main road of Hung Hoa residential group, some sections have rainwater drainage sewers, the population density is moderate, the distance from the house to the edge of the road is 0 - 5m.		

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts and Risks	Site-specific Mitigation Measures
			- There are some trees, electrical poles and wires at roadside.		
	 **Km1+560**	 **Km1+560**	- Km 1+560: The right-hand pipeline passes the memorial (7 m from the construction site) martyr of Ky Hung Commune Medical Center. - There are some trees, electrical poles and wires at roadside	- Traffic disturbance or interruptions - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Impacts on landscape in the area near the memorial - Trees may be affected or damaged - Electrical wires and poles may be damaged	- Install warning signs and signboards - Arrange staff to direct traffic in rush hours - Provide temporary access to houses and shops when access is disrupted - Schedule construction of the section passing the memorial to avoid the Memorial Day. - Do not load materials and wastes within 50 m from the memorial gates. - Allocate staff to instruct crane drivers to avoid trees. - Request the workers to avoid damages to tree branches when carrying out manual works - Allocate staff to instruct crane drivers to avoid poles and wires.
	 **Km 1+670**	 **Km 1+670**	- Km 1+670: the pipeline passes in front of Ky Hung commune preschool.	- Increased traffic safety risks - Affect the movement of students and affect children's health and beauty of school building - Noise distract teaching activities and disturb sleep at lunch time	- Inform school managers at least one week in advance. - Install speed limit at 5km/h sign at the two ends of the section - Arrange staff to direct traffic at school opening and school over time at sections in front of the school. - Install fence and warning signs open holes, channels - Do not load materials and wastes within 50 m from school gates

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts and Risks	Site-specific Mitigation Measures
					- Do not load or unload materials during rush hours
	 **Km1+770**	 **Km 1+770**	- Km 1+770: the pipeline passes Ky Hung commune ancient well. - 3 m from the road	- Increased traffic safety risks - Impacts of landscape values - Deep dredging can cause a risk of land slippage or well cracks	- Inform community at least two weeks before construction commencement. - Install "slow down" and "road work" as the two end of construction area - Carry out inventory of weak structures before compaction - Apply static compaction method at these sections only
	 **Km2+050**	 **Km2+050**	- Km 2+050: The pipeline runs along the main road of DT12 road, some sections have rainwater drainage sewers, the population density is moderate, the distance from the house to the edge of the road is 0 - 5m. - There are some trees, electrical poles and wires at roadside.	- Traffic disturbance or interruptions - Impacts on Urban landscape related to temporary loading of waste and bulky materials - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Trees may be affected or damaged - Electrical wires and poles may be damaged	- Avoid construction activities at night time. Incase not avoidable, inform community at least two weeks. - Install fence with reflective band, warning signs and signboards around open trenches. - Provide adequate lighting at night time. - Arrange staff to direct traffic in rush hours, to instruct crane drivers to avoid trees, poles and wires. - Do not load material and waste within 20m from shop. Transport materials/ wastes away as soon as possible. - Water the road in hot, dry day and clean up the site daily.

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts and Risks	Site-specific Mitigation Measures
	 **Km2+530**	 **Km2+530**	- Km 2+530: The pipeline runs along the main road of Tran Phu hamlet, some sections have rainwater drainage sewers, the population density is moderate, the distance from the house to the edge of the road is 0 - 5m. - There are some trees, electrical poles and wires at roadside.		- Build temporary drains along the alignment - Minimize temporary loading of materials and wastes, levelling the materials as soon as possible - Arrange staff to direct during the loading/unloading in rush hours - Provide temporary access to houses and shops when access is disrupted
	 **Km2+960**	 **Km2+960**	- Km 2+960: The pipeline passes through Hung Phu hamlet, the land around is vacant land.	- Urban landscape related to temporary loading of waste and bulky materials - Increased safety risks at the road curve	- Inform community at least two weeks before construction commencement. - Install “slow down” and “road work” as the two end of construction area - Provide adequate lighting at night time - Do not load materials and wastes on the road, tidy up the sites daily

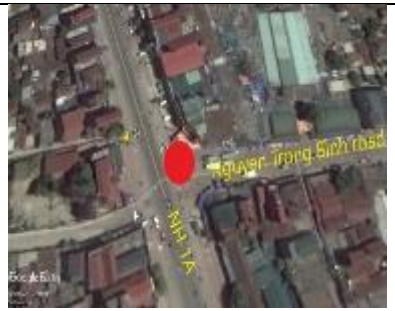
Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts and Risks	Site-specific Mitigation Measures
	 **Km3+300**	 **Km3+300**	- - Km 3+300: The pipeline runs along the main road of Hung Phu hamlet, some sections have rainwater drainage sewers, the population density is moderate, the distance from the house to the edge of the road is 0 - 5m. - There are some trees, electrical poles and wires at roadside.	- Traffic disturbance or interruptions - Impacts on Urban landscape related to temporary loading of waste and bulky materials - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Trees may be affected or damaged - Electrical wires and poles may be damaged	- Avoid construction activities at night time. Incase not avoidable, inform community at least two weeks. - Install fence with reflective band, warning signs and signboards around open trenches. - Provide adequate lighting at night time. - Arrange staff to direct traffic in rush hours, to instruct crane drivers to avoid trees, poles and wires. - Do not load material and waste within 20m from shop. Transport materials/ wastes away as soon as possible. - Water the road in hot, dry day and clean up the site daily. - Build temporary drains along the alignment - Minimize temporary loading of materials and wastes, levelling the materials as soon as possible - Arrange staff to direct during the loading/unloading in rush hours - Provide temporary access to houses and shops when access is disrupted

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts and Risks	Site-specific Mitigation Measures
Concrete road in Hung Hoa residential group connecting with Ky Hung communal main road	 **Km 0+000**	 **Km 0+000**	- -Pipeline characteristics: The pipeline runs along Hung Hoa residential area connecting the main road of Ky Hung commune, some sections have rainwater drainage sewers, the population density is moderate, the distance from the houses to the road edge is 0 - 5m. - There are some trees, electrical poles and wires at roadside.	- Traffic disturbance or interruptions - Impacts on Urban landscape related to temporary loading of waste and bulky materials - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Trees may be affected or damaged - Electrical wires and poles may be damaged	- Avoid construction activities at night time. Incase not avoidable, inform community at least two weeks. - Install fence with reflective band, warning signs and signboards around open trenches. - Provide adequate lighting at night time. - Arrange staff to direct traffic in rush hours, to instruct crane drivers to avoid trees, poles and wires. - Do not load material and waste within 20m from shop. Transport materials/ wastes away as soon as possible. - Water the road in hot, dry day and clean up the site daily. - Build temporary drains along the alignment - Minimize temporary loading of materials and wastes, levelling the materials as soon as possible - Arrange staff to direct during the loading/unloading in rush hours - Provide temporary access to houses and shops when access is disrupted

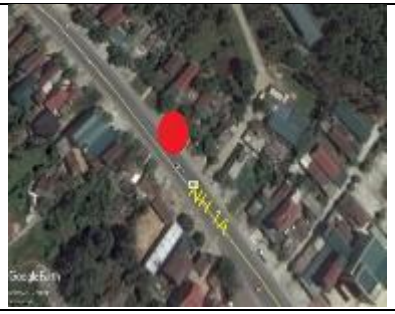
Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts and Risks	Site-specific Mitigation Measures
	 **Km0+ 400**	 **Km0+ 400**	- - Km 0+400: the pipeline runs along the concrete road in Ky Hung commune, some sections have rainwater drainage sewers, the population density is moderate, the distance from the houses to the road edge is 0 - 5m. - There are some trees, electrical poles and wires at roadside	-	-
	 **Km0+680**	 **Km0+680**	- - Km 0+680: the pipeline passes in front of Ky Hung commune primary school	- Increased traffic safety risks - Affect the movement of students dust affect children's health and beauty of school building - Noise distract teaching activities and disturb sleep at lunch time	- Inform school managers at least one week in advance. - Install speed limit at 5km/h sign at the two ends of the section - Arrange staff to direct traffic at school opening and school over time at sections in front of the school. - Install fence and warning signs open holes, channels - Do not load materials and wastes within 50 m from school gates - Do not load or unload materials during rush hours

Location	Picture on Current Status		Notable Characteristics	Site-specific Impacts and Risks	Site-specific Mitigation Measures
	 **Km0+930**	 **Km0+930**	- - Km 0+930: Connect with the pipeline of the trunk road in Ky Hung commune. - The nearest resident's house is 1 - 3m from the road edge. -	- Traffic disturbance or interruptions - Impacts on Urban landscape related to temporary loading of waste and bulky materials - Disruption or damage to existing underground facilities (water pipes) - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops - Trees may be affected or damaged - Electrical wires and poles may be damaged	- Install warning signs and signboards - Arrange staff to direct traffic in rush hours - Build temporary drains along the alignment - Level and protect slops/walls created from land sliding risks - Minimize temporary loading of materials and wastes, levelling the materials as soon as possible - Inform community at least two days in advance about service disruption - Arrange staff to direct during the loading/unloading in rush hours - Provide temporary access to houses and shops when access is disrupted - Allocate staff to instruct crane drivers to avoid trees, poles and wires

Table 74: Site-specific Mitigation Measures for Pumping Stations

Pumping Station	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
Station 1: NH 1A, near Ky Anh town post office			- PS1 is on vacant land on the sidewalk of an existing two-laned, 8-10m wide asphalt road. - The area is densely populated with many shops and offices - Excavation depth is 4.6 m	- Risks of landslides and subsidence. - Increase traffic accidents risk. - Safety risk for local community. - Disturbed locals business as access is obstructed; - Affecting drainage capability - Dust, waste, negative impact on landscape. - Damage to trees, electrical poles and wires.	- Inform local community at least one week in advance. - Install speed limit at 5km/h sign at the two ends of the section - Install steel sheet piles to protect the PS chamber walls. - Place fence with reflective band and warning sign surrounding the PS. - Provide adequate lighting at and warning at night. - Minimize load of materials and wastes surrounding the PS. - Maintain drainage function to the existing drainage (pumping) - Cleanup the site daily. - Allocate staff to instruct crane drivers to avoid trees, poles and wires.
Station 2: NH 1A, near the Ky Anh Market.			- PS2 is on vacant land on the sidewalk nearby Ky Anh Market, 8-10m wide asphalt road. - The area is densely populated with many shops and offices - Excavation depth is 3.1 m	- Risks of landslides and subsidence. - Increase traffic accidents risk. - Safety risk for local community. - Disturbed locals business as access is obstructed; - Affecting drainage capability - Dust, waste, negative impact on landscape. - Damage to electrical poles and wires.	- Inform local community at least one week in advance. - Install speed limit at 5km/h sign at the two ends of the section - Install steel sheet piles to protect the PS chamber walls. - Place fence with reflective band and warning sign surrounding the PS. - Provide adequate lighting at and warning at night. - Minimize load of materials and wastes surrounding the PS. - Maintain drainage function to the existing drainage (pumping) - Cleanup the site daily.

Pumping Station	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
					- Allocate staff to instruct crane drivers to avoid poles and wires.
Station 3: NH 1A, near Vincom mall			- PS3 is on vacant land on the sidewalk nearby Vincom Mall construction site, 8-10m wide asphalt road. - The area is Vincom Mall construction site - Excavation depth is 6.7 m	- Risks of landslides and subsidence. - Increase traffic accidents risk. - Affecting drainage capability - Dust, waste, negative impact on landscape. - Damage to electrical poles and wires.	- Install speed limit at 5km/h sign at the two ends of the section - Install steel sheet piles to protect the PS chamber walls. - Place fence with reflective band and warning sign surrounding the PS. - Provide adequate lighting at and warning at night. - Minimize load of materials and wastes surrounding the PS. - Maintain drainage function to the existing drainage (pumping) - Cleanup the site daily. - Allocate staff to instruct crane drivers to avoid poles and wires.
Station 4: Km4+011 NH 1A, opposite Thuy Son lake			- PS4 is on vacant land on the sidewalk opposite Thuy Son lake, 8-10m wide asphalt road. - The area is densely populated with many shops and offices - Excavation depth is 3.6 m	- Risks of landslides and subsidence. - Increase traffic accidents risk. - Safety risk for local community. - Disturbed locals business as access is obstructed; - Affecting drainage capability	- Inform local community at least one week in advance. - Install speed limit at 5km/h sign at the two ends of the section - Install steel sheet piles to protect the PS chamber walls. - Place fence with reflective band and warning sign surrounding the PS. - Provide adequate lighting at and warning at night.

Pumping Station	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
Station 5: Km 3+110, on NH 1A..			- PS5 is on vacant land on the sidewalk nearby Hanh Phong grocery store, 8-10m wide asphalt road. - The area is densely populated with many shops and offices Excavation depth is 3.6 m	- Risks of landslides and subsidence. - Dust, waste, negative impact on landscape. - Damage to trees, electrical poles and wires. -	- Install steel sheet piles to protect the PS chamber walls. Minimize load of materials and wastes surrounding the PS. - Maintain drainage function to the existing drainage (pumping) - Cleanup the site daily. - Allocate staff to instruct crane drivers to avoid trees, poles and wires. -
Station 6: Km 2+750, on NH 1A.			- PS6 is on vacant land on the sidewalk nearby Viet Hai store, 8-10m wide asphalt road. - The area is densely populated with many shops and offices - Excavation depth is 4.9 m	- Risks of landslides and subsidence. - Increase traffic accidents risk. - Safety risk for local community. - Disturbed locals business as access is obstructed; - Affecting drainage capability - Dust, waste, negative impact on landscape. - Damage to trees, electrical poles and wires. -	- Inform local community at least one week in advance. - Install speed limit at 5km/h sign at the two ends of the section - Install steel sheet piles to protect the PS chamber walls. - Place fence with reflective band and warning sign surrounding the PS. - Provide adequate lighting at and warning at night. - Minimize load of materials and wastes surrounding the PS. - Maintain drainage function to the existing drainage (pumping) - Cleanup the site daily. - Allocate staff to instruct crane drivers to avoid trees, poles and wires.
Station 7: Km1+655, on NH 1A			- PS7 is on vacant land on the sidewalk nearby Hoa Sua coffee shop, 8-10m wide asphalt road. - The area is densely populated		

Pumping Station	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
			with many shops and offices - Excavation depth is 2.7 m		
Station 8: Km1+000, on NH 1A.			- PS8 is on vacant land on the sidewalk, 70m from Ngay bridge, 8-10m wide asphalt road. - The area is sparsely populated. - Excavation depth is 5.3 m -	- Risks of landslides and subsidence. - Increase traffic accidents risk. - Affecting drainage capability - Dust, waste, negative impact on landscape. - Damage to electrical poles and wires. -	- Inform local community at least one week in advance. - Install speed limit at 5km/h sign at the two ends of the section - Install steel sheet piles to protect the PS chamber walls. - Place fence with reflective band and warning sign surrounding the PS. - Provide adequate lighting at and warning at night. - Minimize load of materials and wastes surrounding the PS. - Maintain drainage function to the existing drainage (pumping) - Cleanup the site daily. - Allocate staff to instruct crane drivers to avoid poles and wires.
Station 9: Km0+150, on NH 1A.			- PS9 is on vacant land on the sidewalk, near Thuy Hang hotel, 8-10m wide asphalt road. - The area is sparsely populated. - Excavation depth is 4 m	- Risks of landslides and subsidence. - Increase traffic accidents risk. - Safety risk for local community. - Disturbed locals business as access is obstructed;	- Inform local community at least one week in advance. - Install speed limit at 5km/h sign at the two ends of the section - Install steel sheet piles to protect the PS chamber walls. - Place fence with reflective band and warning sign surrounding the PS. - Provide adequate lighting at and warning at night.

Pumping Station	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
Station 10: Ky Hung commune main road			- PS10 is on vacant land on the sidewalk at the intersection of internal road, 4-6m wide concrete road. - The area is densely populated with local houses - Excavation depth is 3.6 m	- Risks of landslides and subsidence. - Affecting drainage capability - Dust, waste, negative impact on landscape. - Damage to electrical poles and wires.	- Install steel sheet piles to protect the PS chamber walls. - Minimize load of materials and wastes surrounding the PS. - Maintain drainage function to the existing drainage (pumping) - Cleanup the site daily. - Allocate staff to instruct crane drivers to avoid poles and wires.
Station 11: Ky Hung commune road, far from the treatment plant			- PS11 is on vacant land on the sidewalk, 4-6m wide concrete road. - Excavation depth is 7 m, PS chamber 14m2	- Risks of landslides and subsidence. - accidents risk for the workers and the public, traffic means at and surrounding the PS. - Dust, waste, negative impact on landscape.	- Inform local community at least one week in advance. - Install speed limit at 5km/h sign at the two ends of the section - Install steel sheet piles to protect the PS chamber walls. - Place fence with reflective band and warning sign surrounding the PS. - Provide adequate lighting at and warning at night. - Minimize load of materials and wastes surrounding the PS. - Cleanup the site daily

Table 75: Site-specific Mitigation Measures of The WWTP

Location	Picture on Current Status	Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
Treatment plant	 	- The wastewater treatment plant is 80 m from the Tri River. Currently, land use at this site is agricultural land and aquaculture production. - There are some irrigation ditches on this agricultural land - Feedback from consultation meeting shows that the WWTP area is subject to flooding in rainy season - The nearest house is nearly 1km from the WWTP - The elevation of the WWTP is higher than the ground level of 3m	- Disrupt accessibility to agricultural land surrounding the WWTP - Construction materials and wastes may overflow onto the surrounding agricultural land causing damages to crop trees, affecting productivity - Irrigation ditches in agricultural land around the plant may be filled up and blocked - Surface runoff on elevated ground at the WWTP sites may disturb existing drainage pattern and cause more serious localized flooding - Surface runoff passing the WWTP may affect the the Tris quality of river - Social disturbance related to concentration of the works to the WWTP area - Environmental pollution due to waste and wastewater from camps - Safety risks for the workers during the construction of WWTP discharge structure - Safety risks for community	- Inform community at least two weeks before construction commencement - Provide and maintain alternative access to agricultural land surrounding the WWTP - Install fences to separate the WWTP site with agricultural land - Create and maintain drainage ditches surrounding the WWTP - Create sedimentation traps within WWTP and clean up regularly - Provide septic tank toilets for worker to use at WWTP site - Enforce compliance with Codes of Conducts - Build connect compensatory irrigation canal before disposal - Provide and enforce the workers to use life vest when working on the river.

Location	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
Access road to the plant D400 pipelines will be installed along this road			- The access road to the current treatment station is Ky Hung commune concrete road. The end of the route (500m) approaching the station is now the trail used by people for their agricultural and production purposes. Traffic density on this road is sparse. -	- Traffic disturbance or interruptions, particularly during seedling and harvesting - Dust on local roads due to materials from trucks dropping on the road - Soil subsidence, landslide risks due to deep excavation or on weak soil or excavation taking place too close to existing or structures - Impacts on landscape related to temporary loading of waste and bulky materials - Disruption or damage to existing underground facilities such as water pipes, - Safety risks for the public and workers, particularly at night time during the loading/ unloading and operations related to bulky items such as pre-casted pipes - Disrupt accessibility to roadside houses - Disturb, interrupt the business of roadside shops	- Do not load materials and wastes on the road, tidy up the sites daily - Inform community about construction schedule at least one crop in advance - Build temporary drains along the alignment - Carry out inventory of weak structures before compaction - Apply static compaction method at these sections only - Level and protect slops/walls created from land sliding risks - Prioritize the construction of temporary/ permanent access to maintain accessibility from one to the other side of the road - Arrange staff to assist local people when carrying heavy loads crossing the roads - Inform community at least two days in advance about service interruption - Provide temporary access to houses and shops when access is disrupted

Location	Picture on Current Status		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
Discharge area			- The discharge receiving area of the WWTP treatment station is located in the downstream of Tri River, and the receiving river section is 65m wide. There is aquaculture land located 1km downstream from the treatment plant which belongs to residents in Tran Phu village, Ky Hung commune. There is almost no fishing and navigation activities on this river section	- The main risk in the construction phase is construction materials, waste is washed into the river - Accident risk for the workers – falling into river and drowned - Accident risk for the community.	- Do not load materials and wastes within 50 m from the river, tidy up the sites daily - Place fence and warning sign along the pipes and at the outfall. - Minimize the volume of wastes and materials temporary loaded at the site - Load materials and wastes tidily, remove the wastes from construction sites on daily basis - Include rules about not swimming in the river if do not have the skills and notice to workers. Take a drowning warning sign at the construction site

Table 76: Site-specific Mitigation Measure for The Main Road Connecting Urban Centers

Location	Picture of Current Status at noticeable locations	Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
Km0+000 ÷ 0+450		- The beginning point is connected to the road to Formosa Industrial Park, the existing road and a bridge that the proposed alignment cut through is no longer in use. - New bridges will be built at the site of the old bridge. - The current land use along the alignments are agricultural land. - Differences between existing ground elevation and road surface is from 0 – 1.8m	Elevated ground may disrupt/obstruct access of local people when moving from one to the other side of the road Drainage pattern may be disrupted	Build temporary and permanent access so as local people can move safely from one side to the other side of the road. Installation of temporary drainage ditches

Location	Picture of Current Status at noticeable locations		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
	 **Km 0+00**	 **Km 0+450**	- Beginning and ending point, intersects with existing road.	- Increased traffic safety risks at the intersection with the existing road - Disrupt the existing irrigation canals in this area - Blockage of irrigation canals if soil is spreading the irrigation canal	- Install and maintain warning board, fence with reflect band in the area near the intersections. - Apply speed limit at 5km/h at the intersection. - Provide adequate lighting at night. - Cover or protect to prevent material from falling in to canal/agricultural land - Cleanup irrigation canal when materials are found in canal - Rebuild and connect compensatory irrigation canals before blocking off the affected canal section
	 **Km0+100**		- The existing bridge which is no longer in use will be demolished, new bridge will be built at this location - The nearest house is nearly 1 km from this bridge	- Sedimentation of stream due to granular materials - Stream water pollution due to construction and excavated materials and bentonite may fall into the water - Safety and Drowning risks	- Loading materials and wastes at least 20 m from water surface - Create sedimentation traps to prevent highly turbid surface runoff from entering the stream - Direct and collect bentonite I storage tank - Install nets along the bridge during demolition - Provide lifevest and belts, hard hats and force the workers to use.

Location	Picture of Current Status at noticeable locations	Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
			to the workers particularly when water level is high	
Km 0+450 ÷ 2+610		- The beginning point is the intersection with the existing road to Ky Ninh beach. - The elevation of the road surface is higher than the ground level of 0.73 to 3.5m - The beginning and the end of the section are near the residential area. There are some houses scatterly loacated in these two areas - The alignment cut through agricultural land and some existing roads, and a powerline - A new bridge will be	- Cut through the existing rural power grid - Increased traffic safety risk at the intersections between the proposed road and other existing roads. - The section runs through agricultural land with annual crops. Separate agricultural land, particularly during the seedling and harvesting season - The road with elevated ground may disrupt/ obstruct access of local people when moving from one to the	- Inform community at least two weeks before construction commencement, and at least two days before power cut off for poles relocation - Install and maintain warning board, fence with reflect band in the area near the intersections. - Do not load materials and wastes on the existing roads, tidy up the sites daily - Provide convenience access so as local people can move safely from one side to the other side of the road - Schedule construction to avoid extensive excavation/filling during the seeding and harvesting timeBuild temporary and permanent access so as local people can move

Location	Picture of Current Status at noticeable locations		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
			constructed at Km 1+772	other side of the road - Drainage pattern may be disrupted	safely from one side to the other side of the road. - Installation of temporary drainage ditches -
	 **Km 0+455**	 **Km 0+455**		- Damages to existing power lines/poles - Noise, vibration, construction solid wastes, and wastewater may affect the houses nearby - Irrigation canals may be blocked due to soils and from construction sites - Construction materials and wastes fill up some areas in cultivating land. - Disturbance to seedling, cultivation and	- Inform community at least two weeks before construction commencement, and at least two days before power cut off for poles relocation - Arrange staff to direct the drivers when cranes, bulldozers, trucks are working within 10 m from power poles/lines - Install at least 3m tall fences and sign surround disturbed areas to separate construction areas with houses located within 20 m from construction sites - Cleanup irrigation canal when materials are found in canal
	 **Km1+800**	 **Km2+610**			

Location	Picture of Current Status at noticeable locations		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
				harvesting activities <u>New Bridge construction:</u> - Sedimentation of stream due to granular materials - Safety and drowning risks for workers when working at height and on water surface. - Stream water pollution due to bentonite from drilling and sedimentation from excavation.	- Rebuild and connect compensatory canals before blocking off the affected canal section - Provide convenience access so as local people can move safely from one side to the other side of the road - Schedule construction to avoid extensive excavation/filling during the seeding and harvesting time <u>New Bridge construction:</u> - Loading materials and wastes at least 20 m from water surface - Provide lifevest and belts, hard hats and force the workers to use. - Install nets along the bridge during demolition - Direct and collect bentonite storage tank - Create sedimentation traps to prevent highly turbid surface runoff from entering the stream

Location	Picture of Current Status at noticeable locations	Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
Km 2+610 ÷ 3+390		- Population density is moderate. - This section cut through agricultural land and some roads including an existing rice field internal road at km2+610, intercommunal road at km3+000. - The elevation of the road surface is higher than the ground level of 0.71 to 2.93m - There are existing power pole and lines near construction area. - A bridge crossing Tri River will be built at Km2 + 900.	- Risks of damage cause to power poles and wires. - Traffic disturbance and increased traffic safety risk at the intersections, particularly provincial road No. 12. - Disrupt irrigation canals in this area: blockage of irrigation canals, spreading of soils to the irrigation canal - Construction materials and wastes affecting the cultivating fields and arable agricultural land - Noise, vibration, construction solid wastes, and wastewater may	- Inform community at least two weeks before construction commencement and at least two days before power cut off for poles relocation - Arrange staff to direct the drivers when cranes, bulldozers, trucks are working within 10 m from power poles/lines - Install reflective fences, warning and speed limit signs at 5km/h at construction area - Arrange staff to direct traffic at curvy sections - Tidy up the site regularly - Provide adequate lighting at night - Cover and place signs at open trenches - Cleanup irrigation canal when material are found in canal - Rebuild and connect compensatory canals before blocking off the affected canal section - Minimize the volume of wastes and materials temporary loaded at the site

Location	Picture of Current Status at noticeable locations	Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
			affect houses nearby - The road with elevated ground may disrupt/ obstruct access of local people when moving from one to the other side of the road - Drainage pattern may be disrupted	- Schedule construction to avoid extensive excavation/filling during the harvesting time - Build 3m high fence to separate construction sites from existing houses located within 20 m from construction sitesBuild temporary and permanent access so as local people can move safely from one side to the other side of the road. - Installation of temporary drainage ditches
	 **Km2+610**  **Km2+830**	- Road sections cut through residential land, agricultural land and internal roads in the commune. - House is located two sides along the route - The Ancestral worshipping houses in the area are located 30-100m from the site	- Noise, vibration, construction solid wastes, and wastewater may affect houses nearby - Disturbing traffic and daily activities of local people - May interrupt worshiping activities in the 1st and 15th days of each lunar month.	- Inform community at least two weeks before construction commencement - Install reflective fences, warning and speed limit signs at 5km/h at construction area within 20 m from houses - Water the disturbed areas at least in hot and dry days - Minimize the volume of wastes and materials temporary loaded at the site - Schedule construction of the section passing the area

Location	Picture of Current Status at noticeable locations		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
					to avoid the first and full moon of lunar months
	 **Km2+900**	 **Km 3+00**	- Road sections cut through residential land, agricultural land and internal roads in the commune. - The area has many temple, sensitive works - House is located alternately along the route - The bridge will be constructed at Km 2+900. At present, the river has concrete embankment at this section. Bridge access road cut through	- Disturbing traffic and daily activities of local people - Noise, vibration, construction solid wastes, and wastewater may affect houses nearby <u>New Bridge construction:</u> - Stream water pollution due to bentonite from drilling and sedimentation from excavation. - Safety risks for workers when working at	- Inform communities about construction schedule at least two weeks in advance - Water the road section passing residential houses in dry weather - Collect and clean up materials and waste dropped on the road - Avoid activities generating high noise between 10pm and 6 am - Water the road section passing residential houses in dry weather - Collect and clean up materials and waste dropped on the road <u>New Bridge construction</u>: - Direct and collect bentonite to storage tank

Location	Picture of Current Status at noticeable locations		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
			garden land with bamboo trees, pomelo, barring onia and bushes. The nearest house is 18 – 35m from the bridge.	height and on water surface. - River sedimentation risk due to material and waste temporary loaded at the riverside. - Over clearance of vegetation cover and trees at garden land	- Loading materials and wastes at least 20 m from water surface - Provide lifevest and belts, hard hats and force the workers to use - Install nets along the bridge during demolition - Minimize the volume of wastes and materials temporary loaded at the site - Do not load construction waste within 10 m from riverside - Marking the boundary of site clearance area to avoid over clearance of vegetation cover and trees
	 **Km3+390**		- Cut through concrete road and field - The house will be removed	- Disturbing traffic and agricultural production activities of local people	- Schedule construction to avoid extensive excavation/filling during the harvesting time - Provide and maintain temporary access road before demolishing the existing road

Location	Picture of Current Status at noticeable locations	Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
Km 3+390 ÷ 3+750		- The section is a rice field in Ky Chau commune. - The distance from the center line to the nearest house is 90m. - The elevation of the road surface is higher than the ground level of 0 to 1.43 m	- Separate thus disrupt accessibility to agricultural land, particularly during seedling and harvesting seasons - Disturbing traffic and daily activities of local people - The road with elevated ground may disrupt/ obstruct access of local people when moving from one to the other side of the road - Drainage pattern may be disrupted	- Inform community at least two weeks before construction commencement - Install reflective fences, warning and speed limit signs at 5km/h at construction area within 20 m from houses - Install at least 3m tall fences and sign to separate construction areas with local.houses. - Water the disturbed areas at least in hot and dry days - Build temporary and permanent access so as local people can move safely from one side to the other side of the road. - Installation of temporary drainage ditches
	 **Km 3+390**  **Km 3+390**	- Cut through fields, irrigation canals and concrete roads -	- An existing road will be demolished - Irrigation canals may be blocked due to soils and from construction sites	- Build temporary access road before demolishing the existing road - Rebuild and connect compensatory canals before blocking off the affected canal section - Cleanup irrigation canal when material are found in canal

Location	Picture of Current Status at noticeable locations		Notable Characters	Site-specific Impacts and Risks	Site-specific Mitigation Measures
					- Protect to prevent material from falling in to canal/agricultural land
	 **Km3+750**	 **Nguyen Thi Bich Chau road – End point**	- The end point is the intersection with Nguyen Thi Bich Chau	- Traffic disturbance and traffic safety at intersections with existing roads - Disturbance to agricultural cultivation activities	- Install reflective fences, warning and speed limit signs at 5km/h at construction area - Provide adequate lighting at night - Avoid loading materials and wastes on the roads - Provide convenience access so as local people can move safely from one side to the other side of the road

Site-specific Mitigation Measure for the Disposal site

- Cover the truck to limit the spread of material along the way
- Arrange the bulldozer after pouring to minimize the risk of sliding and wind erosion.

Site-specific Mitigation Measure for the Worker camp

Table 77: Site-specific Mitigation Measures at Worker Camp

Item	Location	Characteristic	Impacts	Mitigation Measures
Tri river embankment and Thuy Son lake embankment	Left bank of Tri river, 500m from Tri river bridge	Vacant land near the embankment area, 100m from the nearest residential area There currently are some shrubs in the area 	- If there is no clean water for workers to use, it can affect health - There may be risks of over clearance to vegetation and vegetation cover - Snakes and reptiles can crawl into camps to bite workers - waste from the camp could affect camp' hygiene and health of workers - Waste and wastewater from camp may pollute Tri river water	- Register worker with local authority. - Arrange pipe connection or clean water tank trucks for camp water supply - Mark and bound the clearance area - Build closed camp house structure - Plant lemongrass surrounding the camp to prevent snakes - Provide septic tanks and waste bins for camps - Do not use chemical for vegetation cover clearance.
Main central road	Km 0+000	Vacant land near the road to Formosa and inside the residential area. 	- Snakes and reptiles can crawl into camps to bite workers - Stagnant wastewater and waste from the camp could affect camp' hygiene and health of workers - Social conflict with local resident - Disrupt existing drainage at site	- Register worker with local authority. - Mark and bound the clearance area - Build closed camp house structure - Plant lemongrass surrounding the camp to prevent snakes - Provide septic tanks and waste bins for camps - Built alternative drainage ditch. - Enforce compliance to code of conduct
	Km 2+610	Vacant land, 50m from the residential area and Tri river 	- If there is no clean water for workers to use, it can affect health - Waste water, waste from the camps can pollute the surrounding agricultural land - Waste and wastewater from camp may pollute Tri river water	- Register worker with local authority. - Arrange pipe connection or clean water tank trucks for camp water supply - Mark and bound the clearance area - Build closed camp house structure - Provide septic tanks and waste bins for camps

			- Social disturbance from interaction between the worker and community	- Enforce compliance to code of conduct
Wastewater collection and treatment plant	At the WWTP site	Vacant land inside the treatment plant, 500m from the nearest area. 	- Waste water, waste from the camps can pollute the surrounding agricultural land and surface water in Tri river - If there is no clean water for workers to use, it can affect health	- Register worker with local authority. - Arrange pipe connection or clean water tank trucks for camp water supply - Mark and bound the clearance area - Build closed camp house structure - Provide septic tanks and waste bins for camps - Include rules about not swimming in the river. Place a drowning warning sign at the construction site

5.1.4 Measures to be Implemented during Operation Phase

a. The WWTP and Main Pipeline

(1) Measures to Minimize Impact on Receiving Water

- An online monitoring system is to be installed at the WWTP for controlling the wastewater inflow, quality of the influent and effluent at the WWTP;
- The quality of sample effluent from the WWTP must be analyzed once every 3 months;
- Treatment facilities are to be periodically checked and maintained to ensure highest performance of the system;
- Troubleshooting plans must be prepared to respond promptly to incidents in due time (standby generators, standby pumps, discharge incident) in order not to disrupt the operation of the plant;
- Based on an assessment of risks to human health and the environment, consider re-use of treated effluent, especially in areas with limited raw water supplies. Treated wastewater quality for land application or other uses should be consistent with the relevant public health-based guidance from the World Health Organization (WHO) and applicable national requirements

(2) Odor Control

The following measures are required to prevent, minimize, and control air emissions and odors during operation:

- Domestic waste and sludge generated during the operation of the plant will be safely collected by specialized tank trucks and transported away by URENCO to serve the planting of urban green trees or to be dumped at landfill of the town. This will reduce bad odors generated from sludge;
- There will be plans to periodically test and monitor air concentrations to obtain proper evaluation and control operation processes in a logical manner.

(3) Sludge

- Land application or other beneficial re-use of the WWTP residuals should be considered but only based on an assessment of risks to human health and the environment. Quality of residuals for land application should be consistent with the relevant public health-based guidance from the World Health Organization (WHO)[19] and applicable national requirements;
- Processing, disposal and re-use of wastewater treatment plant residuals should be consistent with applicable national requirements;
- URENCO will be employed to periodically dredge sludge from sewer systems and transport this sludge for disposal at landfill. Transportation will be carried out by specialized tank trucks to avoid odor emission and sludge spillage along the route.

(4) Domestic Wastewater

Domestic wastewater from the WWTP will be pretreated through 3 compartments of septic tanks before being discharged into combined sewers and will be directed to the treatment area.

(5) Hazardous Waste

- The subproject owner will register as the owner of hazardous waste according to Circular No. 36/2015/TT-BTNMT dated 30 June 2015 on hazardous waste management;
- Containers of hazardous waste are to be placed on flat floors without tilting, tumbling, and must be free from stormwater infiltration. Collected hazardous waste will be stored in containers/houses and labeled as currently stipulated. Packaging materials for chemicals will be returned to the suppliers;
- Once every 2-3 months, the WWTP will have to employ a local contractor tasked with handing hazardous waste to collect, transport and handle such waste;
- Empty chlorine containers are to be returned to manufacturers

5.2 Implementation Arrangements, Roles and Responsibilities

5.2.1 Institutional Arrangements

The key stake holders in environmental management of the Project include the Project Management Unit, the Construction Supervision Consultant, the Contractor, Ministry of Natural Resources and Environment, Ky Anh Provincial Department of Natural Resources and Environment, People's Committees at town/districts and communes levels. The relationships and contacts between the key stakeholders in the environmental management of the project are shown in Figure 43.

[19] WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater (2006).

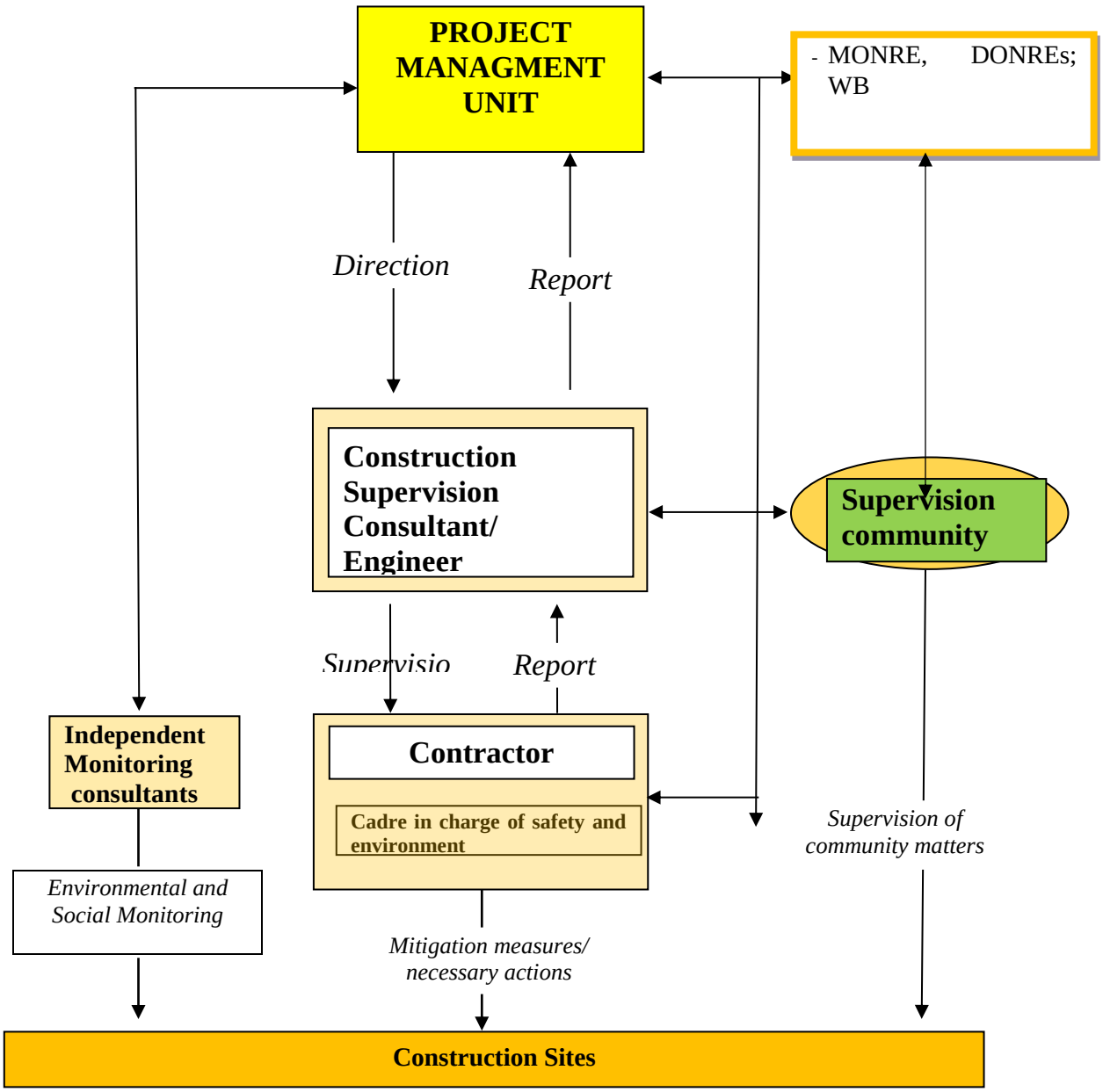


Figure 43: Environmental Management Institutional Chart

5.2.2 Roles and Responsibilities

Specifics responsibility of stakeholders are shown in Table 61 below.

Table 78: Roles and Responsibilities of Stakeholders

Stakeholders	Responsibility
Provincial People's Committee (PPC)	- Overall responsible for environmental and social safeguard implementation and compliance monitoring - Ensure that adequate resources are allocated for safeguard implementation and management
Project Management Unit (PMU) - Project Owner	- The PMU is responsible for monitoring and supervision to ensure that the Project comply with the World Bank Safeguard Policies and Vietnamese legislations: - PMU assign an Environmental Officer (EO) in charge to monitor the implementation and compliance of ESMP and at least a Social and resettlement Officer (EO) to oversee resettlement and compensation issues - Ensure that the mitigation measures proposed in the ESIA are adequately incorporated into relevant project documents such as engineering design, cost estimations, bidding and contractual documents - Ensure that adequate environmental and safety training, monitoring and supervision tasks are included in the Terms of References of the Construction Supervisors - Communicate and coordinate with relevant authorities at central and local levels, with independent monitoring consultants to facilitate public consultation, implementation of mitigation measures and voluntary monitoring - Coordinate with the Construction supervisors to carry out due diligence review of additional sites such as borrow pits and quarries as and when required - Monitor to ensure timely and effective implementation of the ESMP: - Monitor environmental compliance; - Carry out unannounced inspections; - Review periodical reports submitted by the construction supervision consultant (CSC) and IEMC and take follow up actions - Submit periodical safeguard reports to WB and MONRE. - assure all resettlement activities will take place in compliance with this RP. Specifically, PMU will: - Cooperate with PPCs, and relevant local competent agencies to conduct compensation and resettlement. - Organize training and building capacity activities for PPMUs. - Cooperate with PMUs to monitor compensation, resettlement; - Report periodically on resettlement progress to PPC and the WB.
PMU Environmental Officer (EO):	- The EO will advise the PMU leaders on solutions for environmental issues to ensure the compliance with WB's safeguard polices and regulations stipulated by Vietnamese Government. - The EO will coordinate with the CSC team and the contractors to carry out due diligence review of borrow pits, quarries identified during construction phase and decide whether they are eligible for use in the Project - Coordinate with the Environmental Officer of the Construction Supervision team to carry out environmental due diligence review

Stakeholders	Responsibility
	of borrow pits, quarries, disposal sites as well as any other sites required under the Project
PMU Social and Resettlement Officer	- The Social and Resettlement Officer in charge will help with solving social and resettlement issues of the Project, supervising the compliance with RP, participate in investigation and solving complaints related to social issues and land acquisition.
Design consultant	- Incorporate mitigation measures in to engineering design, cost estimates, bidding documents and construction contract,
Construction Supervision Consultant/Engineer (CSC/CSE)	- Provide training for contractor's workers on environment, occupational safety, HIV/Aids training - Arrange for environmental quality monitoring and report preparation for submission to relevant government authorities - Monitor and supervise the Contractors to ensure compliance with ESIA/ESMP - Direct the Contractors to carry out corrective measures when excessive pollution or any non-compliant is detected - Carry out due diligence review of additional sites such as borrow pits and quarries as and when required - When detecting any excessive pollution or any non-compliant contractor, the construction supervision consultant shall propose and direct related contractors to implement additional mitigation or corrective measures to address the issues/impacts to satisfactory level. - Propose the PMU to suspend partially or entirely the construction work if a contractor fails to meet the requirements on safety and environmental protection as agreed or stated in the contract. - Prepare and maintain records on complaints and incidents
Independent Monitoring Consultant	- provide training to relevant project stakeholders, particularly PMU staff and Construction supervision engineers on project environmental management system - Carry out random compliance monitoring and prepare reports.
Contractors	- Appoint staff responsible for environmental, health and safety issues - Prepare site specific ESMP - Implement mitigation measures in accordance with contract terms and conditions
Community	- Carry out voluntary environmental monitoring according to Decree 19/2015/ND-CP, in order to: - Participate in consultation activities
Town People's Committee (TPC)	- Prepare annual land use plan and submit to competent authorities for review and approval of changed land use plan. - Issue Notice of Land Acquisition and direct Town Board for Compensation and Land Acquisition,. - Adjusting or grant a new land use right certificate for the land to be acquired, and for relocated households. - Settle complaints related to land acquisition, compensation, support and resettlement in the district within its jurisdiction. - Approve compensation support and resettlement assessment to be carried out by the Town BCLA

Stakeholders	Responsibility
Town Board for Compensation and Land Acquisition (TBCLA):	- Coordinate with PMU and TPCs to disseminate information and policies on project's policies on compensation and support; - Organize for compensation payment and support to affected people; - Arrange resettlement for relocated households, land acquisition, and handover of acquired land to the construction units; - Lead and coordinate with PMU and TPCs to implement Livelihood Restoration Program; - Assist TPCs to settle complaints concerning land acquisition, compensation and resettlement. - Support TPC in issuance of LURCs for land plot in the resettlement site. - Support the external monitoring consultant for conducting independent resettlement monitoring.
Ward/Commune People's Committee:	- Cooperate with TBCLA in arranging compensation payment, resettlement and livelihood restoration implementation; - Provide documents related to the origin of land use of AHH; confirming the eligibility of affected persons and affected assets; - Assist TPC, TBCLA to organize meetings and public consultations; - Resolve complaints at the ward/commune level - as prescribed by the existing law; Assist authorities to resolve land disputes and complaints.

With regards to compensation, support and resettlements, the following stakeholders will undertake their respective responsibility which are with their line of authorities.

5.3 Environmental Compliance Framework

5.3.1 Environmental Duties of the Ky Anh PMU/Detail Design Consultants

During the preparation of TORs for consulting services and construction bidding documents, Ky Anh PMU will also work closely with the consultants to ensure that: i) contract packaging and cost estimations includes ESMP implementation, including the services on independent safeguard monitoring, environmental sampling/monitoring and compliance supervision, reporting etc.; ii) ECOPs and relevant common as well as site-specific mitigation measures are incorporated into the bidding documents; iii) environmental supervision and training are included in the scope of works assigned to the construction supervision consultant.

At feasibility study/detail engineering design stage, the Ky Anh PMU shall work closely with the feasibility study consultants and detail design engineers to ensure that the greening/landscaping, environmental friendly solutions and relevant mitigation measures proposed in the ESIA/ESMP are considered and incorporated into the engineering design as appropriate.

During construction phase, the Ky Anh PMU shall work closely with the supervision consultant to monitor the compliance of contractors and report to relevant authorities. The Ky Anh PMU will also direct the supervision consultant and contractors on the actions to be undertaken in case when issues are arisen, incidents or accidents etc.

The Ky Anh PMU will assign at least one staff with suitable qualifications to be Environmental Officer (EO) throughout project implementation. The EO will oversee environmental issues and monitor safeguard compliance of the subproject. The EO will be supported by the Independent Monitorign Consultant, the Environmetnal Officers of the construction supervision team as well as the contractors.

5.3.2 Environmental Duties of the Contractors

The contractors firstly shall adhere to minimize impacts that may result from the project construction activities and secondly, apply the mitigation measures stated in the ESMP to prevent harm and nuisances on local communities and the environment caused the construction and operation phases.

Remedial actions that cannot be effectively carried out during construction should be implemented upon completion of the works (and before issuance of the Works Acceptance Certificates).

The Contractors' duties include but not limit to:

- Comply with relevant legislative requirements governing the environment, public health and safety;
- Work within the scope of contractual requirements and other tender conditions;
- Organize representatives of the construction team to participate in the joint site inspections undertaken by the Environmental Supervisors (ES) of the CSC;
- Carry out any corrective actions instructed by the Environmental Officer (EO) of the PMU and the ES;
- In case of non-compliances/ discrepancies, carry out investigation and submit proposals on mitigation measures, and implement remedial measures to reduce environmental impacts;
- Stop construction activities, which generate adverse impacts, upon receiving instructions from the EO and the ES. Propose and implement corrective actions and carry out alternative construction methods, if required, to minimize the environmental impacts; Non-compliance by the Contractor will be cause for suspension of works and other penalties until the non-compliance has been resolved to the satisfaction of the EO and the ES.
- In case the contractor proposes to use source of raw materials that have not been covered in subproject ESIA, the contractor will report to the CSCs and PMUs and coordinate with them in carrying out due –diligence environmental review of these materials sources to assess their compliance to national environmental requirements. Only complied sources can be used under DCIDP.
- The contractor shall be responsible for implementation of corrective measures at his costs. The contractor shall also be responsible for paying the costs of damages caused by non-compliance to ESMO and/or applicable environmental regulations.

5.3.3 Contractor's Environmental and Social Management Plan (CESMP)

After contract signing, based on the approved ESIA and contractual conditions, the contractors will prepare a Contractor's Site-specific Environmental Management Plan (CESMP) for each contract packages and submit to the CSC and PMU for review and clearance.

The objective of the Contractor Environmental and Social Management Plan (CESMP) is to provide information for environmental management during the proposed works/activities on site of Ky Anh subproject. This is to ensure that the Contractor (and any subcontractors) have minimal impact on the environment. The CESMP will detail how the contractor will mitigate construction impacts and documents the contractor's response to inspecting, monitoring, verifying, internal auditing and correcting or improving environmental performance. The CESMP must be site-specific and should include details of control measures that will be implemented on site to minimize any potential environmental impacts from the proposed works/activities. If the proposed works/activities contained within the CESMP are altered during the Contract, the CESMP will be required to be modified by the Contractor to reflect these changes or modifications. The contents of the CESMP should include the followings:

(i) A statement of policy, providing a definition of the Contractor's environmental policy and an indication of commitment to the execution of its Site Environmental Management Plan.

(ii) A brief document description; Date of issue; Revision status; Distribution list; and preparation personnel details and signoff.

(iii) Applicable laws and regulations associated with the requirements in the subproject ESMP.

(iv) Identification of the contractor licenses, permits and approval associated with the CESMP.

(v) Details on how the environmental impacts identified in the subproject ESIA will be managed on site, including: 1) the site-specific measures to mitigate impacts during construction; 2) ECOPs; 3) the Contractor ESMP to be developed after the contractor is selected and before construction starts; and 4) the Contractor's Dredging Management Plan that the contractor is required to develop.

(vi) Contractor's plan to carry out self-monitoring of implementation of the CESMP.

(vii) Detailed environmental training that all site contractor personnel (including subcontractors) are required to undertake. As a minimum all contractor personnel working at the subproject sites must: i) be familiar and understand the CESMP for the works; ii) be aware of their environmental responsibilities and legal obligations on site; and iii) undertake health and safety and emergency response training.

(viii) Specific capabilities, support mechanisms and resources necessary to satisfactorily implement the CESMP. Detailed environmental responsibilities of all contractor personnel including subcontractors working on site with appropriate knowledge, skills and training for specific tasks shall be identified.

(ix) The contractor shall be responsible for preparing monthly environmental reports, as a section within the Progress report required in the bidding document, including accidental report if any, for submitting to the subproject owner. The contents of these reports may include following details:

- Implementation of the Contractor's CESMP complying with the agreed program;
- Any difficulties encountered in the implementation of the CESMP and recommendations for remedying them for the future;
- The number and type of non-compliances and proposed corrective actions;

- Reports from the Subcontractors involved in the implementation of the CESMP, including minutes of meetings and discussions held by the Contractor;
- Minutes of meeting from discussions held with the subproject owner regarding implementation of the CESMP.

5.3.4 Contractor's Site Environment Officer (SEO)

The Contractor shall be required to appoint a competent individual as the Contractor's Site Environmental Officer (SEO). The SEO must be appropriately trained in environmental management and possess necessary skills to transfer environmental management knowledge to all personnel involved in the contract. The SEO will be responsible for monitoring the contractor's compliance with the ESMP requirements and the environmental specifications. The duties of the SEO shall include but not limit to the following:

- Carry out environmental site inspections to assess and audit the contractors' site practice, equipment and work methods with respect to pollution control and adequacy of environmental mitigation measures implemented;
- Monitor compliance with environmental protection measures, pollution prevention and control measures and contractual requirements;
- Monitor the implementation of environmental mitigation measures;
- Prepare audit reports for the environmental monitoring data and site environmental conditions;
- Investigate complaints and recommend any required corrective measures;
- Advise the contractor on environment improvement, awareness and proactive pollution prevention measures;
- Recommend suitable mitigation measures to the contractor in the case of non-compliance. Carry out additional monitoring of noncompliance instructed by the EO/ES;
- Inform the contractor and ECO/ES of environmental issues, submit contractor's ESMP Implementation Plan to the ECO/ES, and relevant authorities, if required;
- Keep detailed records of all site activities that may relate to the environment.

5.3.5 Independent Environmental Monitoring Consultant (IEMC)

The Independent Environmental Monitoring Consultant (IEMC) contracted by PMU shall carry out the monitoring.

- Provide training for PMU and the CSC, and the representatives of the Contractors on socio-environmental, health and safety issues related to construction;
- Evaluate environmental quality at the areas affected by the construction activities (including site observations, reviewing environmental monitoring reports provided by the CSC);
- Review contractor's environmental compliance including the implementation of mitigation measures and documentation;
- Review PMU and CSC compliance to ESMP.
- The IEMC will also provide technical advice and assistance to the PMU and the EO in environmental matters.

5.3.6 Environmental Supervision during Construction

During th e construction phase, a team of qualified Environmental Supervisors (ES) as part of the Construction Supervision Consultant (CSC) shall carry out environmental supervision as part of construction supervision. Both the CSC and ES will be mobilized before the commencement of any construction activities. The CSC and ES are responsible for inspecting and supervising all construction activities to ensure that mitigation measures adopted in the ESMP are properly implemented, and that the negative environmental impacts of the Project are minimized. Specifically, the ES will:

- Review and assess on behalf of the PMU whether the construction design meets the requirements of the mitigation and management measures of the ESMP;
- Review and clear contractor's SEMP;
- Coordinate with PMU Environmental Officer (EO) in reviewing environmental compliance at newly proposed borrow pits and quarries and advise PMU on whether these are eligible for use by the Project;
- Verify and confirm with PMU environmental supervision procedures; parameters, monitoring locations, equipment and results;
- Supervise contractor's implementation of its CESMP including their performance, experience and handling of site environmental issues, and provide corrective instructions if needed;
- Provide training about HIV /Aids awareness for the contractor's workers, CSC team and PMU officers;
- Implement the environmental quality sampling and prepare periodical environmental monitoring reports, including reports on ESMP implementation status to the PPMU and prepare environmental supervision statement during the construction phase; and
- Review payment requests related to environmental mitigation costs if applicable

Noting that the involvement of the community in the process of implementing the ESMP is an activity entirely voluntary in nature, for the benefit of the community and his family. Therefore, the involvement of communities in monitoring the ESMP will not be receiving salaries.

5.3.7 Compliance with Legal and Contractual Requirements

The constructions activities shall comply not only with the general contractual condition on environmental protection and pollution control requirements in the bidding document, the subproject ESMP, and the CESMP, but also with environmental protection and pollution control laws of the Socialist Republic of Vietnam.

All the works method statements submitted by the Contractors to the ES for approval shall also be sent to the EO to review whether sufficient environmental protection and pollution control measures have been included.

The ES shall also review the progress and program of the works to ensure that relevant environmental laws have not been violated, and that any potential for violating the laws can be prevented.

The Contractors shall copy relevant documents to the EO and the ES. The documents shall at least include updated work progress reports, updated work measures, and application letters for different license/ permits under the environmental protection laws, and all valid license/ permits.

The EO and the ES shall also have access, upon request, to the Site Log-Books.

After reviewing the documents, the EO or the ES shall advise and the Contractors of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the EO or the ES concludes that the status on license/ permit application and any environmental protection and pollution control preparation works may not comply with the work measures or may result in potential violation of environmental protection and pollution control requirements, they shall advise the Contractor accordingly.

5.3.8 Penalty System

In the compliance framework, if non-compliance with the Contractor's ESMP and environmental regulations is discovered by the CSC/PMU during site supervision, 2% of interim payment value of the contractors of the month will be held back. The Contractors will be given a grace period (determined by the CSC/PMU) to repair violation. If the Contractors satisfactorily perform the repairs within the grace period (confirmed by the CSC/PMU), no penalty is incurred and the upholding money will be paid to the contractor. However, if the Contractors fail to successfully make necessary repairs within the grace period, the Contractors will pay a third party to repair the damages (deduction from the retained amount).

In case that the CSC/ES do not detect non-compliance with environmental regulations of the Contractors, they will be responsible for payment to repair the violation.

5.3.9 RP and Gender Monitoring

The Project Management Unit (PMU) is responsible for conducting internal monitoring the implementation of the RP. In addition, the PMU will hire an external monitoring agency (EMA) to undertake independent monitoring of the process of RP implementation and to assess living standard of the affected people during and after the completion of the resettlement.

Both internal and external (independent) monitoring will regularly (on a monthly basis for internal and biannual basis for independent monitoring). An end-of-project evaluation on the implementation of resettlement is required and report will be prepared to confirm whether the objectives of OP 4.12 were achieved.

5.4 Environmental and Social Monitoring Program

The monitoring of environmental quality will be done during the construction and operation phase according to Table 79 with costs estimated in Table 80. Monitoring locations is presented in Annex 3.

Table 79: Environmental Quality Monitoring Program

Parameter and frequency	Location
Construction Phase	
Air quality Applicble Regulation: QCVN 26:2010/BTNMT, QCVN 27:2010/BTNMT, QCVN 05:2013/BTNMT	
Noise, vibration TSP dust, CO, SO_2 and NO_2 Monitoring frequency once every quarter	MK1- Thuy Son lake near NH1A; Coordinates: 18°4'7"N – 106°17'42" E. MK2- Tri bridge; Coordinates: 18°4'18"N – 106°17'30" E. MK3- Residential area on the left bank of Tri river; Coordinates: 18°4'14"N – 106°17'25" E.

	MK4- Residential area on the right bank of Tri river; Coordinates: 18°4'15"N – 106°17'23" E; MK5- At the right wind direction in the WWTP construction area; Coordinates: 18°5'23"N – 106°18'58" E. MK6- At the end wind direction in the WWTP construction area: 18°5'24"N – 106°18'57" E. MK7- Junction with Nguyen Thi Bich Chau road; Coordinates: 18°4'58"N – 106°18'7" E. MK8- Culture house in Hieu Chau hamlet; Coordinates: 18°5'19"N – 106°18'6" E.
Surface Water Quality Monitoring Regulation for reference: QCVN 08-MT:2015/BTNMT)	
pH, T, turbidity, DO, COD, BOD_5, TSS, Cu, Zn, Fe, Cd, AS, Pb, oil and grease, coliform Once every quarter	NM5 – Near Tri river bridge; Coordinates: 18°4'18"N – 106°17'30" E NM6 – At the middle of Tri river embankment section; Coordinates: 18°4'14"N – 106°17'23" E NM7 – At the construction area of wastewater treatment plant; Coordinates: 18°5'23"N – 106°18'59"E
Municiple wastewater Regulation for reference: QCVN 14:2008/BTNMT)	
pH, TDS, TSS, BOD_5, NH_4^+, NO_3^-, PO_4^{3-}, oil and Coliforms. Once every quarter	PS2: Coordinates: 18° 4'41.98"N - 106°17'19.21"E PS4: Coordinates: 18° 4'8.84"N - 106°17'40.84"E PS8: Coordinates: 18° 3'7.20"N - 106°19'7.95"E PS11: Coordinates: 18° 5'11.29"N – 106°18'34.88"E
Operation Phase (in the first 2 years)	
Air quality Applicable Regulation: QCVN 26:2010/BTNMT, QCVN 27:2010/BTNMT, QCVN 05:2013/BTNMT	
Noise, vibration TSP dust, CO, SO_2 and NO_2 Monitoring frequency once every quarter	MK5- At the right wind direction in the WWTP construction area; Coordinates: 18°5'23"N – 106°18'58" E. MK6- At the end wind direction in the WWTP construction area: 18°5'24"N – 106°18'57" E.
Surface Water Quality Monitoring Regulation for reference: QCVN 08-MT:2015/BTNMT)	
pH, turbidity, DO, COD, BOD_5, TSS, oil and grease, coliform. Once every quarter	NM7 – At the construction area of wastewater treatment plant; Coordinates: 18°5'23"N – 106°18'59"E NM12 – Tri river water, distanced 50m from upstream of WWTP discharge point. NM13 – Tri river water, distanced 100m and 1km from downstream of WWTP discharge point.
Municiple wastewater Regulation for reference: QCVN 14:2008/BTNMT)	
pH, TDS, TSS, BOD_5, NH_4^+, NO_3^-, PO_4^{3-}, oil and Coliforms. Once every quarter	NT1: The WWTP input

Table 80: Estimated Costs for Environmental Quality Monitoring

No	Item	Unit	Quantity/ volume	Unit price (VND)	Amount (VND)
1.1	*Air quality*				*139,680,000*

No	Item	Unit	Quantity/ volume	Unit price (VND)	Amount (VND)
-	Noise	Sample	96	70,000	6,720,000
-	Vibration	Sample	96	150,000	14,400,000
-	TSP	Sample	96	140,000	13,440,000
-	CO	Sample	96	448,000	43,008,000
-	SO2		96	343,000	32,928,000
-	NO2	Sample	96	304,000	29,184,000
1,3	*Surface water (6 samples x 8 times)*				*133,632,000*
-	Temperature	Sample	48	34,000	1,632,000
-	pH	Sample	48	34,000	1,632,000
-	Turbidity	Sample	48	70,000	3,360,000
-	DO	Sample	48	92,000	4,416,000
-	COD	Sample	48	172,000	8,256,000
-	BOD_5	Sample	48	163,000	7,824,000
-	TSS	Sample	48	115,000	5,520,000
-	Copper (Cu)	Sample	48	217,000	10,416,000
-	Lead (Pb)	Sample	48	229,000	10,992,000
-	Zinc (Zn)	Sample	48	217,000	10,416,000
-	Iron (Fe)	Sample	48	217,000	10,416,000
-	Cadmium (Cd)	Sample	48	229,000	10,992,000
-	Arsenic (As)	Sample	48	272,000	13,056,000
-	Total oil and grease	Sample	48	418,000	20,064,000
-	Coliform	Sample	48	305,000	14,640,000
1,4	*Domestic/household water (1 samples/location x 4 locations x 8 times)*				*63,616,000*
-	pH	Sample	32	41,000	1,312,000
-	NH_4^+	Sample	32	146,000	4,672,000
-	Surfactant	Sample	32	420,000	13,440,000
-	BOD5	Sample	32	192,000	6,144,000
-	TSS	Sample	32	119,000	3,808,000
-	NO_3^-	Sample	32	146,000	4,672,000
-	Total oil and grease	Sample	32	430,000	13,760,000
-	PO_4^{3-}	Sample	32	184,000	5,888,000
-	Coliform	Sample	32	310,000	9,920,000
	Total				***336,928,000***

5.5 Capacity building, training

5.5.1 PMU Environmental Management Capacity

At present, PMU has one staff who manages the social safeguard department. In addition, a number of MB staffs have implemented a number of ODA projects funded by WB and other sources such as ADB, AFD, etc..

5.5.2 Safeguard Capacity Building Program

PMU's gap in practical construction safeguard management experience will be addressed by the mobilisation of Construction Supervision Consultants who will also be in charge of environmental supervision during construction phase. Independent Monitoring Consultant are also expected to provide some environmental trainning for the CSC and the contractors

Table 81 provides a proposed training program on safeguards policies.

Table 81: Training on Environmental Management

Trainees	**PMU, CSC**
Topic	Environmental supervision, monitoring and reporting
Participants	Environmental staffs, CSC chief engineers, CSC site engineers, Site Engineer of contractors (if mobilised), community leaders
Training frequency	Immediately after the project becomes effective and at least one month prior to construction commencement of the first bid package. Refresh training will follow after six months.
Duration	One day each training
Responsibility	Independent environmental Monitoring Consultant (IEMC) deliver the training.
Trainees	**CONTRACTORS**
Topic	Implementation of mitigation measures, Codes of Conducts, health and safety, HIV/Aids training
Participants	Contractor's workers
Training frequency	Within two weeks since construction commencement
Duration	A half of day training Refresh training every six months, at least one hour each section
Responsibility	CSC Environmental Officer

5.6 Cost Estimation

The below table will provide estimated cost in implementing ESMP and will include (i) the costs of implementing mitigation measures by the contractor, (ii) expenses supervised by CSC, (iii) cost of environmental quality monitoring, (iv) cost of the independent environmental monitoring consultant (IEMC), (v) the cost of capacity building program, (vi) the cost of making detailed ESMP prior to construction. The costs of implementing mitigation measures during construction will be a part of the value of construction contracts and the costs of environmental supervision of CSC will be a part of the value of construction supervision contracts. Besides, cost to build capacity for environmental management is performed by IEMC will be calculated into the total cost of the independent environmental monitoring.

Estimated cost for implementing ESMP will be summarized in Table 82 below.

Table 82: Total Estimated Cost for Implementing ESMP

No.	Items	Unit	Quantity	Unit price	Total amount
				(VNĐ)	(VNĐ)
1	UXO Clearance				1.747.733.776
2	Mitigation measures implementation	As a part of construction contracts values			
3	Environmental compliance monitoring	As a part of construction supervision contract value			
4	Environmental quality monitoring				336.928.000
		(as part of construction supervision contract)			
5	Training on HIV /Aids for the workers, PMU staff	Sites	8	20.000.000	160.000.000
		(as part of construction supervision contract)			
6	Independent monitoring, including:				1.060.000.000
	Environmental supervision	*Trip*	*8*	*60.000.000*	*480.000.000*
	Social supervision	*Trip*	*8*	*60.000.000*	*480.000.000*
	Training on capacity building	*Lump sum*		*100.000.000*	*100.000.000*
7	***Total***				***3.304.661.776***

5.7 Grievance Redress Mechanism (GRM)

Within the Vietnamese legal framework, citizen rights to complain are protected. As part of overall implementation of the project, a grievance redress mechanism (GRM) will be developed by the ESU of the PMU, according procedures, responsible persons and contact information will be developed. It will be readily accessible to ensure that grievances shall be handled and resolved at the lowest level as quickly as possible. The mechanism will provide a framework within which complaints about environmental and safety issues can be handled, grievances can be addressed and disputes can be settled promptly. The GRM will be in place before construction commencement.

During construction, the GRM will be managed by the contractors under supervision of the CSC. The contractors will inform the affected communities and communes about the GRM availability to handle complaints and concerns about the project. This will be done via the community consultation and information disclosure process under which the contractors will communicate with the affected communities and interested authorities on a regular basis. Meetings will be held at least quarterly, monthly information brochures will be published, announcements will be placed in local media, and notices of upcoming planned activities will be posted, etc. The contractors should indicate contact for any complaints when the contractors announce construction schedule to local communities.

All complaints and corresponding actions undertaken by the contractors will be recorded in project safeguard monitoring reports. Complaints and claims for damages could be lodged as follows:

- Verbally: direct to the CSC and/ or the contractors' safeguard staff or representatives at the site offices.
- In writing: by hand-delivering or posting a written complaint to specified addresses.
- By telephone, fax, e-mails: to the CSC, the contractors' safeguard staff or representatives.

Upon receipt of a complaint, the CSC, the contractors' safeguard staff or representatives will register the complaint in a complaint file and maintain a log of events pertaining to it thereafter, until it is resolved. Immediately after receipt, four copies of the complaint will be prepared. The original will be kept in the file, one copy will be used by the contractor's safeguard staff, one copy will be forwarded to the CSC, and the fourth copy to the PMU within 24 hours since receipt of the complaint.
Information to be recorded in the complaint log will consist of:

- The date and time of the complaint.
- The name, address and contact details of the complainant.
- A short description of the complaint.
- Actions taken to address the complaint, including contact persons and findings at each step in the complaint redress process.
- The dates and times when the complainant is contacted during the redress process.
- The final resolution of the complaint.
- The date, time and manner in which the complainant was informed thereof.
- The complainant's signature when resolution has been obtained.

Minor complaints will be dealt with within one week. Within two weeks (and weekly thereafter), a written reply will be delivered to the complainant (by hand, post, fax, e-mails) indicating the procedures taken and progress to date.

The main objective will be to resolve an issue as quickly as possible by the simplest means, involving as few people as possible, and at the lowest possible level. Only when an issue cannot be resolved at the simplest level and/ or within 15 days, will other authorities be involved. Such a situation may arise, for example, when damages are claimed, the to-be-paid amount cannot be resolved, or damage causes are determined.

Grievance Redress Mechanism for affected person who lose means of income/livelihoods, are Summarized in the Table 83 below.

Table 83: Grievance Redress Mechanism

First Stage – Ward/Commnune People's Committee (WPC):	PAP may submit their complaint – either in written or verbal, to the office of the Ward/Commune People's Committee. W/C PC will receive the complaints and will notify the W/C PC leaders of the complaint. The Chairman of the W/C PC will meet the complainant in person and will solve it within 15 days following the receipt of the complaint.
Second Stage – Town People's Committee (TPC):	After 15 days since the submission of the complaints, if the aggrieved person does not have any response from the W/C PC, or if the aggrieved person is not satisfied with the decision taken on his/her complaint, the PAP may take the case, either in written or verbal, to the Reception Unit of Town People's Committee. The Town People's Committee will have 30 days since the date

	of receipt of the complaint to resolve the case. The Town People's Committee will register all the complaints submitted and will inform the Town Board for Compensation and Land Acquisition of the Town PC's resolution/assessment results. Aggrieved person may elevate the case to the Courts of Law if they wish.
Third Stage – Provincial People's Committee):	After 30 days, if the aggrieved PAP does not hear from the Town PC, or if the PAP is not satisfied with the decision taken on his/her complaint, the PAP may escalate the case, either in writing or verbal, Provincial People's Committee, or lodge an administrative case with the Town People's Court for resolution. The provincial PC will have 45 days to resolve the complaint to the satisfaction of all the concerned. The provincial PC secretariat is also responsible for registering all complaints that are submitted. Aggrieved person may elevate the case to the Courts of Law if they wish
Final Stage - Courts of Law:	After 45 days following the submission of the complaint at provincial PC, if the aggrieved PAP does not hear from the provincial PC, or if PAP is not satisfied with the decision taken on his/her complaint, PAP may take the case to a Courts of Law for adjudication. Decision by the court will be the final decision. Decision on solving the complaints must be sent to the aggrieved PAPs and concerned parties, and must be posted at the office of the People's Committee where the complaint is solved. After 3 days, the decision/result on resolution must be made available at ward level and after 7 days at the district level.

The World Bank's Grievance Redress Mechanism: Communities and individuals who believe that they are adversely affected by a WB-financed project may submit complaints to the available project-level grievance redress mechanism or the WB's Grievance Redress Service (GRS). The GRS will ensure that complaints received are promptly reviewed to address project-related concerns. The affected communities and individuals of the project may submit their complaints to the WB's independent Inspection Panel that will determine whether harms occurred, or can occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the WB's attention, and the Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit www.worldbank.org/grs. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

CHAPTER 6. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

6.1. Summary on Consultation Process

The World Bank's Environmental Assessment Policy (OP/BP4.01) and the Involutionary Resettlement Policy (OP/BP 4/12) require to conduct public consultation and information disclosure to the affected peoled and local authorities on the environmental and social issues during the project preparation. The public consultation during the preparation of the project's ESIA also complies with the requirement in the Government's Decree No. 18/2015/ND-CP dated 14 February 2015 and the Circular No. 27/2015/TT-BTNMT dated 29 May 2015 by the Ministry of Natural Resources and Environment on environmental assessment and environmental safeguard plan.

The public consultation is conducted with the objectives: (i) to share all information related to the project's investments and expected activities to the local community and stakeholders; and (ii) to gather opinions/comments and concerns from local authorities and the communities. On such basis, the concerns of the local communities are addressed appropriately in the ESIA and the project design options.

6.2. Results of Public Consultation

6.2.1. Consultation with Authorities of Affected Ward/Communes

Consultations with authorities of the affected ward/communes were conducted from 10th to 14th July, 2017, with the following main contents:

- Intrduction on the project, identifying the residential area under the project.
- Introduction on World Bank safeguards on environment and resettlement.
- Existing status of environmental sanitation of works in wards' areas and outstanding issues.
- Solutions contributed by the community to mitigate the environmental impacts and organizations in the project implementation.
- Comments for the construction works.

Public consultations were conducted in 5 wards/communes in Ky Anh town. The content, time and venue of consultations are shown in the table below:

Table 84: Result of the consultation with local authorities

Date	Venue	Nos. of participants	Nos. of female participant	Comments of Authorities	Response of Project's owner
10/07/2017	Ky Trinh ward People's Committee	19	1	- Existing status of local water supply system: The ward already has a main water supply pipeline but has not yet provided services to people. Rate of households using clean water <10%. - Existing status of waste water collection and treatment in the ward: There is no waste water	Project's owner recognizes the comments and will assess the actual situation in the local area to have appropriate and effective design,

Date	Venue	Nos. of participants	Nos. of female participant	Comments of Authorities	Response of Project's owner
				collection and treatment system in the ward. Local authority highly supports the wastewater collection and treatment system under the project and will mobilize people to connect to the system. - Recommendations for project owner: + To compensate and support affected households satisfactorily. + To complete the compensation prior to the construction. + To fully implement mitigation measures for pollution during the construction phase, to avoid disturbing the lives of people. + To recruit local workers.	construction options and policies.
11/07/2017	Ky Hoa commune People's Committee	19	7	- The project owner should thoroughly study the implementation plan and scope of the project: expand Tri river embankment to the weir, support to improve the landscape of the weir reservoir, support the connection from household to general system. - Local authority will fully support project activities such as site clearance. - Recommendations for project owners: - To restore the site after construction of water drainage pipeline. - To minimize land acquisition for all items in the commune. - Project's owner must comply with Vietnamese standards and Donor's requirements the environment - social and technical safeguards.	
12/07/2017	Ky Hung commune People's Committee	30	10	Recommendations for the project owner: - To restore the site after construction. - To provide adequately compensation to the affected households. - To avoid disturbing people's life.	

Date	Venue	Nos. of participants	Nos. of female participant	Comments of Authorities	Response of Project's owner
				- To meet technical requirements and environmental standards for construction. - To ensure construction progress as scheduled.	
13/07/2017	Song Tri ward People's Committee	13	3	- Local authority agrees with the construction items in the ward - The construction of wastewater collection system will face many difficulties because of clearance of solid houses and due to people's inherent habits. Therefore, thorough survey should be conducted prior to construction. - Recommendations for project owner: + The Consultant as well as the Project Management Unit should coordinate with the local authority to avoid overlapping in zoning the project scope. + To complete the compensation prior to construction. + To compensate at market price. + To fully implement environmental safeguards to avoid negative impacts on local people. + To recruit local workers to reduce immigrant pressure.	
14/07/2017	Ky Chau commune People's Committee	19	5	Recommendation for project's owner: - Project's owner should pay attention to the environmental impact during the construction process, including: workers' domestic wastes, construction hazardous waste and to have measures to handle gas, dust and noise. - Project's owner should comply with commitments to have mitigation measures for adverse impacts on the environment. - Compensation and support must be adequate for APs. - Construction contractors should well manage workers, avoid causing public disorder and security.	

Date	Venue	Nos. of participants	Nos. of female participant	Comments of Authorities	Response of Project's owner

In general, comments from consultation with local authorities are summarized as follows:

- Authorities of the wards/communes support the implementation of the project. When being completed, the project will bring great benefits to local people in terms of environmental sanitation, reduction in disease risk, convenient transportation and facilitatation of local economic development.

- Local authorities will create the most favorable conditions and support for the project, especially with regard to land acquisition through site clerance and construction. In addition, the stakeholders should pay appropriate attention and have timely coordination to the site clearance in order to create the best conditions for the people.

- Project's owner is required to seriously implement the approved environmental monitoring program for the project and comply with the standards of the Government of Vietnam and the Donor.

- Recruitment of local labor is recommended for the project implementation to create jobs for local people and reduce the pressure from immigration.

- To make compensation and conduct site clearance before the construction of the project.

- To make compensation at market prices.

- To minimize the effects on physical assets and avoid disturbing the lives of people.

6.2.2. Direct Consultation with Local Affected Communities

Through consultations with local ward/commune authorities, ESIA consultant has reported potential negative impacts during the project implementation and proposed mitigation measures. The Consultant and the Project Management Unit have recognized the comments from local communities for project implementation. The main content of the second consultation is shown in the following table:

Table 85: Result of the consultation with local authorities

Location	Date	Participant	Nos. of participants	Female participant	Comments Received	Response of Project owner
Song Tri ward People's Committee	14/11/ 2017	- PMU's representative - Representative of local authority - Consultant's representative - - Representative of affected households	**30**	6	- Agreed with proposed mitigation measures. Project owner should apply appropriate mitigation measures to prevent environmental impacts on people's lives. - Attention should be paid to gathering of machinery and equipment to ensure people's access during construction. - To spray water to minimize dust generation - Successive construction method should be applied, ensuring construction schedule so that people can actively control their daily life and daily activities. - To announce the site clearance and construction plan to local people. - To use appropriate and standard construction machinery - Trucks carrying material should be covered to prevent materials from falling, affecting environment. - To minimize generation of waste during construction process. - To comply with mitigation measures to minimize negative environmental impacts.	Project's owner recognizes all comments and will have specific assessment on local existing status to have appropriate and effective design, construction, policies and solutions to ensure project's progress so that local people can settle soon.
Ky Hoa commune People's Committee	14/11 /2017	- PMU's representative - Representative of local authority - Consultant's representative	**28**	6	- Successive construction method should be applied, not to disturb people's lives. - When constructing the collection pipeline, there should be guarding and	The PMU recognize comments from local communities.

Location	Date	Participant	Nos. of participants	Female participant	Comments Received	Response of Project owner
		- - Representative of affected households			warning measures to ensure safety for people at nights. - Agreed with proposed mitigation measures. Project owner should control contractor's implementation of the proposed mitigation measures and construction method.	- Impacts and mitigation measures have been included in the EIA - During construction, PMU will work with stakeholders to monitor the construction contractor's implementation of environmental migitation measures.
Ky Trinh ward People's Committee	14/11 /2017	- - PMU's representative - Representative of local authority - Consultant's representative - - Representative of affected households	**40**	13	- Agreed with proposed mitigation measures. Construction of the wastewater collection should be soon commenced to improve people's living condition - Trucks and construction machinery moving in the residential area should not exceed allowable speed to ensure traffic safety. - To spray water to minimize dust generation - To use appropriate machinery to minimize noise and vibration. - Trucks should be covered - During construction, contractor should control the gathering of material, not occupying road bed affecting people's movement. - Reflecting traffic signboards should be installed for safety warning	The PMU recognize comments from local communities. - Impacts and mitigation measures have been included in the EIA - During construction, PMU will work with stakeholders to monitor the construction contractor's implementation of environmental migitation measures
Ky Hung commune	15/11 /2017	- PMU's representative	**40**	11	- Agreed with the project impact and the proposed mitigation measures.	Project's owner recognizes all comments of

Location	Date	Participant	Nos. of participants	Female participant	Comments Received	Response of Project owner
People's Committee		- Representative of local authority - Consultant's representative - Representative of affected households			- During construction, project owner and contractor should apply mitigation measures to minimize dust, noise impacts on people's lives in surrounding area. - Trucks carrying material should be covered - To spray water to minimize dust generation - To use appropriate means and machinery. - To focus on construction, avoid prolonged construction - Project owner should implement the proposed mitigation measures and construction method	local community and will mainstream these recommendations in Environmental Impact Assessment, Resettlement Plan and will propse appropriate mitigation measures.
Ky Chau ward People's Committee	15/11 /2017	- PMU's representative - Representative of local authority - Consultant's representative - Representative of affected households	**35**	9	- Agreed with the proposed mitigation measures. Project owner should implement the proposed mitigation measures and construction method. - To announce the site clearance and construction plan to local people. - To spray water to minimize dust generation - To collect and treat domestic waste and material waste on the construction site, protect environment and people's life. - There should be support policy and information disclosure to affected household if the construction is prolonged. Payment of compensation, support and resettlement should be completed prior	Project's owner recognizes all comments and will have specific assessment on local existing status to have appropriate and effective design, construction, policies and solutions to minimize adverse impacts on project people. Project will be implemented as scheduled in compliance with the legal regulation.

Location	Date	Participant	Nos. of participants	Female participant	Comments Received	Response of Project owner
					to commencement of construction. - Construction material and waste should be gathered properly under agreement of local authority, not to occupy roadbed and sidewalk to affect people and vehicle movement. - There should be control speed for trucks carrying materials in residential area	
Nguyen Ca ancestral temple	15/11 /2017	- PMU's representative - Representative of local authority - Consultant's representative - - Representative of affected household			- Nguyen Ca ancestral temple was constructed in 2008 including one 2-floor building, of which each floor is 40m^2 on the land of the family's head Nguyen Tien Hong. - The ancestral temple is for worshiping 4 generations of the family and worshiping activities are organized on the first day and 15th day of lunar month and in Tet holiday. - The family agreed to be displaced together with other surrounding displaced households and there should be reasonable compensation. - The family wished to be relocated on the road side to get benefits from the project.	PMU recognized all households' comments and committed to implement policies in accordance with the provisions of the Law and the Donor.
Song Tri primary school	15/11 /2017	- PMU's representative - Consultant's representative - Representative of Song Tri primary school			- The school serves a rather large number of pupils. At school time, many pupils and parents gather at the school gate. Picking up of pupils is mostly by car so the traffic condition in front of the school should be ensured. - During construction,	- PMU recognizes comments and recommendations from Song Tri primary school.

Location	Date	Participant	Nos. of participants	Female participant	Comments Received	Response of Project owner
					attention should be paid to gathering location of material, avoid to hinder access to the school - Construction and transportation should be conducted at different time from the peak hours which are school time. - To arrange warning signboards and instructor for parents and pupils at peak hour. - Trucks carrying material should not be overloaded and should run at allowable speed - School authority agreed with the proposed impacts and mitigation measures. Project owner should implement these impacts to ensure a safety for pupils, teachers and parents	-Impacts and mitigation measures have been added in the EIA. - During construction, PMU will work with the stakeholders to monitor environmental mitigation measures provided by contractors.

In general, the local communities have made positive comments on the project. They are aware of the positive and negative impacts that the project brings and expects the project to be implemented soon. However, people also wish that, during the project implementation, especially during the construction period, project's owner and contractors should pay attention to the following issues:

- To disseminate information on construction progress to local people so they can organize their work and daily life to minimize inconvenience during construction. Strengthening construction method should be introduced to avoid widespread construction on the entire area and to narrow the scale of influence.
- To provide necessary assistance to business households who are directly or indirectly affected by the construction process.
- To minimize any delays in construction progress to avoid direct impacts on household income and daily life.
- To minimize dust and noise when transporting materials which are collected from the construction site
- To restore the road surface at least to its original state and to minimize the repetition of soil excavation and backfilling on the same route.

- The project owner must be present at the construction site to closely manage the construction contractor's activities and ensure contact liason so that people can contact in an emergency.

Public consultation in Ky Trinh ward

Public consultation in Ky Hung commune

Public consultation in Ky Hoa commune

Public consultation in Song Tri ward

Public consultation in Ky Chau commune

CONCLUSIONS, RECOMMENDATIONS AND COMMITTMENTS

Conclusions and Recommendations.

The "Dynamic Cities Integrated Development Project – the Ky Anh subproject, Ha Tinh province" is a subproject to support cities and urban areas which have significant role and potentiality to become an economic development center in the region to improve urban infrastructure, landscape, connectivity, environmental sanitation and contribute to the town's development.

The ESIA report was prepared in compliance with WB safeguard policies and applicable Vietnamese regulations. The report will be one of the key documents to be submitted to the World Bank and releant Vientamese Environmental authorities for appraisal and approval before Project negotiation.

The environmental impacts were theoretically and empirically assessed with support from the baseline and statistical data as well as experiences from similar WB projects. The impacts are relatively quantified as best as they can be for all three stages of project's pre-construction, construction and operation.

The subproject is expected to bring about significant positive impacts, particularly improvement of urban connectivity by constructing the main road connecting urban centers, improving environmental sanitation by construction of wastewater collection and treatment system. Tri river dredging and embankment lining will help to reduce flooding risk for residential areas along the river and improve drainage capacity for the river basin. Thuy Son lake embankment lining and dredging will contribute to improve environmental condition and landcape of the town's central area, improving local drainage capacity. Beside the positive impacts, there would be also some potential negative impacts and risks during the pre-construction, construction and operation of the facilities provided under the Subproject. Most of these potential impacts and risks has been predicted to be at low to moderate levels, localised as these would be taking place in areas around construction sites and/or on transport routes and at disposal sites. These impacts and risks can be managed by the implementation of the Environmental and Social Management Plan, taking into account the feedback received during public consultation on ESIA/ESMP.

This subporoject would bring about significant positive environmental benefits, contributing to the sustainable growth of Ky Anh town and in particularly helping the town to achieve several key targets for becoming the class III urban by 2020. Therefore, the subproject should be implemented

REFERRENCES

1. Feasibility Study Report and Basic Design Report of Dynamic Cities Integrated Development Project - Ky Anh Subproject, Ha Tinh province.
2. Planning of the project proposed alignments.
3. Cao Trong Hien et al., 2007. Traffic Environments. Transport Publishing House, Hanoi
4. Ky Anh Statistical Office, 2016. Statistical Yearbook 2016 of Ky Anh Town.
5. Hoang Hue, 2010. Wastewater treatment, Hanoi University of Architecture, Hanoi.
6. Lam Minh Triet, Nguyen Thanh Hung, Nguyen Phuoc Dan, 2002. Urban and Industrial Wastewater Treatment, Publishing House of Ho Chi Minh City National University.
7. Nguyen Quoc Binh, 2005. Air pollution treatment curriculum, Publishing House of National University.
8. Pham Ngoc Dang, 1997. Treatment of Air Pollution and Noise, Publishing House of Science and Technology, Hanoi.
9. Tran Ngoc Chan, 2002. Air and Emissions Treatment, Publishing House of Science and Technology, Hanoi.
10. Tran Hieu Nhue, Tran Duc Ha, Do Hai, 2007. Water supply and drainage, Publishing House of Scientific and Technical, Hanoi.
11. Trịnh Xuân Lai, 2000. Design of wastewater treatment plants, Construction Publishing House, Hanoi.
12. Tran Van Nhan, Ngo Thi Nga, 1999. Curriculum for wastewater treatment technology, Publishing House of Science and Technology, Hanoi.
13. Department of Science, Technology and Environment, Ho Chi Minh City, 1999. Regulations on management of hazardous waste.
14. Vu Tam Hue - Nguyen Phuong Tung, 2000. Guidance on the use of fuel - oil and grease. Publishing scientific and technical.
15. Vietnamese standards and standards on environment.
16. Federal Transit Administration, 2006. Transit Noise And Vibration Impact Assessment, USA.
17. U.S Environmental Protection Angence (USEPA), 1971. Noise from construction equipment and operation, building equipment, and home appliances, USA.
18. U.S Environmental Protection Angence (USEPA), 1991. Environmetal Assessment Sourcebook, Volume II, Sectoral Guidelines, USA.
19. U.S Environmental Protection Angence (USEPA), 1995. AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources.
20. World health organization, 1993. Assessment of Sources of Air, Water and Land Pollution.
21. Clark và đồng nghiệp,2000. Đặc tính hoá học của lớp đất bẩn trên mặt đường. Tạp chí CIWEM.

ANNEX 1- DUE DILIGENCE FOR QUARRIES AND BORROW PITS

1. Con Tria Quarry

Address: Dong Tam Mountain, Ky Tan Commune, Ky Anh District, Ha Tinh Province

No	Main content	Description
1	General information	Time put into operation: 2002 Total mining area: 10 ha Mining capacity: 480,000 m^3/year Mining depth: +40m Documents licensed by the State: Mining license, Decision of EIA approval, (attached with file) Mining technology: Removing topsoil - blasting - mining– transporting stone to crushing and screening system–classifying stone - Sale and consumption.
2	Main environmental issue	Dust: Generated from blasting activities, mining, transport and processing. Noise: Generated from operation of crushing and screening system and transport vehicles Blasting safety: Dust, noise, vibration Occupation safety: possibly occurring due to incompliance with technical and labour safety procedure. Distance to residential area: 1km Buffer zone of trees: planted fully Solid waste: Generated from removing topsoil. Domestic waste: raised by workers' daily activities.
3	Pollution control measures	Dust: - To install water tank, pump and sprayer at the grinding area. - To cover the trucks to minimize dust. Noise: Frequently maintain and repair the screening and crushing system, truck's engine to reduce noise. Blasting safety: - Explosive materials must be approved by authorities before using. Occupational safety: - Setup regulations of occupational safety at office. - Equip labour protective equipment such as protective clothing, hats, gloves, masks,… - Workers directly operating construction machines must be trained and practice the operation properly in case of incidents likely occurring and must always be present at their working places for technically proper operation and inspection. Solid waste: Arrange a disposal area (3,000 m^2) to contain solid waste generated from removing topsoil Domestic waste: to arrange dustbins and contract eligible unit for collection. Wastes will be transported twice a week to Hoanh Son Waste treatment plant for treatment. Monitoring activities: Periodically monitor environmental quality at the quarry area and report to Ky Anh District PC.
4	Hazardous waste	Type: Oil, lubricant Collection and treatment: re-use for machine lubrication
5	Deposit at Environmental Protection Fund	Duration: 15 years Amount: 2,135,218,000 VND, completed prior to 31 January 2027. Implementation option/responsibility: The scheme of environmental rehabilitation of Con Tria quarry was approved by Ha Tinh PPC's

		according to Decision no.3378/QD-UBND dated 13 November, 2012.
6	Workers and heath	Number of workers: 30 persons Labour protective equipment: Protective clothing, shoes, hats, gloves, masks, goggles, welding masks, earplugs Periodical labour safety training: twice a year.
7	EIA report, scheme of environmental rehabilitation	Approved by Ha Tinh PPC's according to no.3378/QD-UBND dated 13/11/2012

Office area

Hazardous warehouse

Quarry area

2. Cup Coi borrow Pit

Address: Cup Coi Mountain, Ky Hung Commune, Ky Anh Town, Ha Tinh Province

No	Main content	Description
1	General Information	Time put into operation: 2016 Total mining area: 3.9 ha Mining capacity: 99,000 m^3/year Mining depth: +35m Documents licensed by the State: Mining license, Decision of environmental approval… (attached with file) Mining technology: Using excavator to load sand directly onto transport trucks
2	Main environmental issues	Dust: Generated from excavation and loading of material and transport activities of trucks. Noise: Generated from excavator and transport trucks Occupation safety: possibly occurring due to incompliance with technical and labour safety procedure. Distance to residential area: at least 2.2 km. Solid waste: Waste stone from exploitation and wastes from activities of trucks. Domestic waste: raised by workers' daily activities.
3	Pollution control measures	Dust: To cover the trucks to minimize dust. Noise: frequently maintaining the engines and truck engines to reduce noise.

		Occupation safety: - Set up occupation safety regulations at office area. - Information disclosure and occupational safety knowledge to workers. - Equip labour protective equipment: protective clothing… - Workers directly operating construction machines must be trained and practice the operation properly. Solid waste: collected and treated. Domestic waste: collected and treated. Monitoring activities: Periodically monitor environmental quality at the mine and report to Ky Anh Town PC
4	Hazardous waste	Volume: engines, gear boxes and combined lubrication. Collection and treatment: re-use for machine lubrication of the excavator.
5	Workers	Number of workers: 10 persons Labour protective equipment: Protective clothing, shoes, hats, gloves, masks, goggles, welding masks, earplugs Periodical labour safety training: twice a year.
6	EIA report, scheme of environmental rehabilitation	- Commitment document of environmental protection approved by Ky Anh Town PC according to Notice no.39/TB-UBND dated 13 July, 2015
Due Diligence at Disproposal Sites for Project		
Background		Total 939,718 m^3 of waste stone and soil generated from the "Dynamic Cities Integrated Development Project - Ky Anh subproject, Ha Tinh province" will be transported to Cup Coi quarry for leveling the exploited area of the quarry. At present, Cup Coi quarry can accommodate 1.5 million m^3 of soil and stone.
Erosion,, Landslide risks at final Disposal site Although the excavated and dredged materials will be disposed of in the existing holes at the quarries, erosion due to strong wind may still happen if no measures are applied the high dumps of loose granular materials are formed. On the other hand, when the dump is high enough, landslide may happen under the impacts of wind and rainwater.		- Level the materials after being disposed off - Slopes of the dumps will not be steeper than 45^o - Create and maintain drainage at the foot of each dump higher than 2 m
Disturbance to existing drainage Unloaded dredged and excavated materials may disturbed, damage or block the existing drains causing localised flooding		- Dispose off the materials at designated areas only - Clean up or repair existing drains if blockage or damages are the contractors' faults. Clean up and repair will be at cost of the contractors
Dust generation Waste material is dry and can scatter in the air without proper management.		- Arrange bulldozer to minimize risk of land erosion and dust. - Use trucks which are covered by canvas to transport material. - Spray water at the disposal site and on the road.

 Quarry area	 Access road to the quarry
 Disposal site	

3. Mui Doi Borrow Pit

Address: Mui Doi, Ky Trinh Ward, Ky Anh Town, Ha Tinh province.

No	Main content	Description
1	General Information	Time put into operation: 2014 Mining capacity: 98,000 m^3/year Documents licensed by the State: Mining license, Decision of environmental approval… (attached with file) Mining technology: Using excavator to load sand directly onto transport trucks
2	Main environmental issues	Dust: Generated from excavation/loading of material and transport activities of trucks. Noise: Generated from excavator and transport trucks Occupation safety: possibly occurring due to incompliance with technical and labour safety procedure. Distance to residential area: at least 2 km. Solid waste: Waste stone from exploitation and wastes scatered from activities of trucks. Domestic waste: raised by workers' daily activities.
3	Pollution control measures	Dust: To cover transportation trucks to minimize dust. Noise: frequently maintaining the engines and truck engines to reduce noise. Occupation safety: - Set up occupation safety regulations at office area. - Information disclosure and occupational safety knowledge to workers. - Equip labour protective equipment: protective clothing… - Workers directly operating construction machines must be trained and practice the operation properly. Solid waste: collected and treated. Domestic waste: collected and treated. Monitoring activities: Periodically monitor environmental quality at the mine and report to Ky Anh Town PC
4	Hazardous waste	Volume: engines, gear boxes and combined lubrication. Collection and treatment: re-use for machine lubrication of the excavator.

5	Workers	Number of workers: 10 persons Labour protective equipment: Protective clothing, shoes, hats, gloves, masks, goggles, welding masks, earplugs Periodical labour safety training: twice a year.
6	EIA report, scheme of environmental rehabilitation	Approved by Ha Tinh PPC's according to no.3948/QĐ-UBND dated 12/10/2015

Quarry area

Access road to the cemetery

ANNEX 2- DCIDP KY ANH DREDGED MATERIALS AND DREDGING MANAGEMENT PLAN

1. Location of Dredging, Volume and Characteristics of Dredged Materials

The Project proposed to rehabilitate the Thuy Son lake, embankment Tri river, construction of main road to connect urban centers, construction of wastewater collection and treatment system. The contractors will carry out both dredging of the parts underwater and excavation of the soil, including top soil, on the embankments at the Tri rive and the Thuy Son lake.

It is estimated that approximately 48,524 m^3 of excavated and dredged materials will be generated during the implementation of Ky Anh DCIDP Sub-project. The estimated volume of dredged and excavated materials of each item are listed in the Table 1 below.

Table 1 –Volume of Dredged Materials

Items	**Excavation**	**Dredge**	**Total**
	m^3	**m^3**	**m^3**
Construction of embankment and road on Tri river banks	10,560	4,762	15,322
Upgrading and Rehabilitating Thuy Son lake	4,695	28,507	33,202
Total	15,255	33,269	48,524

According to baseline data provided in Chapter 2 of the ESIA, all parameters in the samples are within allowable limit. This mean that the sediment samples are not polluted by heavy metal. Eight samples of sediment were taken from the project area and analysed with the results shown in Chapter 2 of ESIA as below

Table 2 – Analysis results on sediment quality

Symbol	**Parameters**							
	(Cu)	**(Pb)**	**(Zn)**	**(Cd)**	**(As)**	**Hydrocacbon**	**Cl-based pestiside**	**P-based pesticide**
	mg/kg dry soil							
TT1	11.6	8.68	93	0.69	3.32	2.1	$<0.045 \times 10^{-3}$	$<0.15 \times 10^{-3}$
TT2	11.4	8.63	98	0.59	3.21	1.8	$<0.045 \times 10^{-3}$	$<0.15 \times 10^{-3}$
TT3	10.8	7.62	83	0.47	3.64	<0.2	$<0.01 \times 10^{-3}$	$<0.01 \times 10^{-3}$
TT4	6.2	8.3	92	0.25	3.08	<0.2	$<0.01 \times 10^{-3}$	$<0.01 \times 10^{-3}$
TT5	7.2	7.81	96	0.25	3.01	<0.4	$<0.01 \times 10^{-3}$	$<0.01 \times 10^{-3}$
TT6	7.6	7.75	92	0.26	3.16	1.6	$<0.03 \times 10^{-3}$	$<0.15 \times 10^{-3}$
QCVN 43:2012/ BTNMT (fresh water)	**197**	**91.3**	**315**	**1.5**	**17**	**100**	**-**	**-**
QCVN 07:2009/BTNMT Ctc (mg/l)	**-**	**15**	**250**	**5**	**2**	**-**		
QCVN **03/2015 agricultural land**	**100**	**70**	**200**	**1.5**	**15**			
Sampling location TT1: Thuy Son lake – near the residential area								

Symbol	Parameters							
	(Cu)	(Pb)	(Zn)	(Cd)	(As)	Hydrocacbon	Cl-based pestiside	P-based pesticide
	mg/kg dry soil							
TT2: Middle of Thuy Son lake TT3: Weir of the Tri river TT4: Near Tri river bridge TT5: At the tentative junction of the main road and Tri river TT6: At the tentative junction of the main road and Cau Bau river								

2. Final Disposal Site

The data in Table 1 also indicate the volumes of top soil and excavated materials, which is 15,255 m^3, and which is approximately 48,524 m^3.

At the meetings between DCDIP PMU with DONRE, DARD, DOC, CPC, Ky Anh CPC, which was concluded that that all top soil, and materials excavated and dredged from the Tri river and the Thuy Son lake will be disposed of in Cup Coi borrow pit. The representative of Cup Coi also have confirmed that they can accept unlimited amount of top soil.

Cup Coi borrow pit description: At present the site is the exploited area of the borrow pit which requires backfilling. The site can get disposal of 1.5 million m3 of construction wastes and can be accessible by NH1A, Le Quang Chi and NH12C

- Time put into operation: 2016
- Total mining area: 3.9 ha
- Mining capacity: 99,000 m^3/year
- Mining depth: +35m
- Documents licensed by the State: Mining license, Decision of environmental approval…
- Mining technology: Using excavator to load sand directly onto transport trucks

Quarry area

Access road to Quarry

3. Contractor's Dredging Management Plan

After contract signing, the Contractor is required to prepare a Contractor's Dredging Management Plan (CDMP) and submitted to the Environmental Consultant of the Construction Supervision team and the PMU Environmental Officer for review and approval. The CDMP will include, but not limited to the followings:

1. The Scope of Works in the Contract package, construction method and schedule

2. Volume and quality of water quality and sediment quality in the dredging area covered by the contract
3. Water users that may be affected by the dredging and embankment lining
4. Materials uploading and transportation method: indicate proposed route of the transport from the dredged site to the disposal area, time of operation, type of vehicles/trucks and proposed measures to reduce the leakage of the dredged materials from the transport trucks,
5. Contractors must prepare a response plan for polluted dredged materials transportation in case leakage of toxic sludge to the environment. The contractors are also responsible for providing fully necessary equipment/tools such brooms, showels... and training their staffs to respond to such incidents of toxic sludge leakage, if any.
6. Schedule to inform the nearby communities about the project, disclosure of name and contact number for possible complaints.
7. Potential social and environmental impacts, including the site-specific impacts and risks
8. Mitigation measures to address the potential impacts and risks. The mitigation measures should be proposed based on ESIA/ECOP, ESMP, SEMP, the potential impacts and mitigation measures presented in Section 4 and 5 of this Plan and the following requirements:
9. Environmental Quality Monitoring plan carried out by the contractor (particularly pH, DO, TSS, BOD, etc. for water and heavy metals including pH, Hg, As, Cd, Cu, Pb, Zn and Cr, Organic Materials and Mineral Oils for sediments and soilfor soil and sediment). The number of samples taken will follow the following guidelines

Table3 . The number of Sediment samples

Volume of dredged (m^3)	No of Sediment Samples
Up to 25,000	3
25,000 to 100,000	4-6

At least one water, soil and sediment sample must be taken for each contract package

- Consultation with affected community about the draft CDMP
- Excavated soils are separated from dredged materials from source. Excavated soils will be reused on-site and off-site as much as possible and transported to the nearest disposal site appraised under ESIA, or identified and approved during detail engineering design or construction phase;
- The mitigation measures are adequate to address the potential social and environmental impacts associated with various steps and activities, areas of influence and receptors of dredging, temporary storage, transportation and final disposal of the dredged materials.
- Field survey are carried out by the Contractor during the preparation of the CDMP in order to identify if there are additional sensitive receptors not identified previously under CCSEP and proposed additional site-specific mitigation measures accordingly.
- Contractor’s environmental monitoring plan are included

- Commitments to carry out corrective actions when excessive pollution is determined, or when there are complaints about environmental pollution, social impacts from any stake holders.

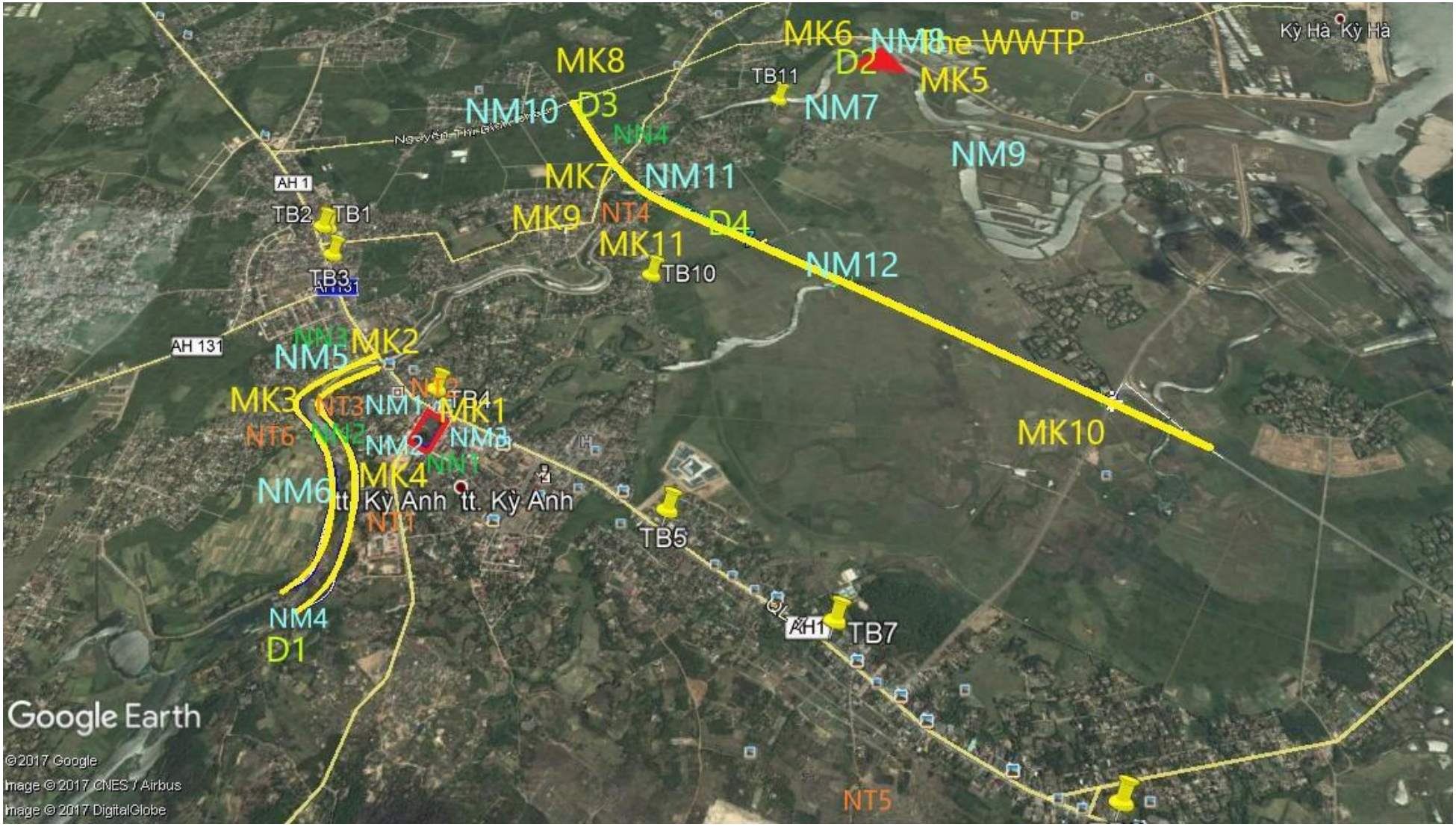
4. Potential Impacts and Mitigation Measures for Dredging and Embankment lining

Impacts and Description	Mitigation Measures
AT DREDGING and TEMPORARY LOADING AREAS	
Interruption to drainage and irrigation service Irrigation service may be disrupted if the existing irrigation ditch is blocked during the dredging and embankment lining at the Tri river	- Inform community at least two weeks before dredging - As river dredging only takes place near the embankment, not on entire river width thus when an irrigation ditch is affected, pump the water from river to ditch if required
Odour and air pollution, nuisance Decomposition of organic matters under anaerobic conditions generates strong odour-generated gases such as SO2, H2S, VOC etc. When the muds are disturbed and excavated, these gases are released much faster into the air. Exposure to odour pollution affect the health of workers, local residents and cause public nuisance	- Inform the community at least one week before dredging is started - Minimise the duration of temporary loading of dredged materials on-site - temporary loading materials must be transported to the disposal site within 48 hours - Load the materials on-site tidily - Do not load the materials temporarily outside the construction corridor determined for each canal section - Avoid loading the sludge in populated residential areas or near public buildings such as kindergarten. Load the sludge as far from the houses and buildings as far as possible - Cover the dredged materials while loading temporarily near sensitive receptors such as shops/restaurants or houses in longer than 48 hours
Dust and nuisance Temporary loading of sludge at the construction site cause nuisance to the public Dry and wet mud may be dropped along the dredging area and on transportation route causing nuisance to the public and traffic safety risks	- Avoid temporary loading of dredged materials on-site - Dredged materials must be transported to the final disposal sites earliest possible and no later than 48 hours from dredging. - Use truck with water-tight tank to transport wet/damp dredged materials; - All trucks must be covered tightly before leaving construction site to minimise dust and mud dispersion along the road
Traffic Disturbance and increased traffic safety risks The placement and operation of dredging equipment and construction plants on the ground, temporary loading of the dredged materials may obstruct or disturb traffic and cause safety risks for the people travelling on the river-side road, particularly at the intersection with NH1A.	- Place "road work" and "slow down" signboards at the intersection between Tri riverside road and NH1A - Arrange worker to observe and direct excavators driver

Impacts and Description	Mitigation Measures
Damages to existing infrastructure and related services Existing irrigation ditch, intake, sluices, drainage pipes, sewers etc., power lines, cables etc. may be demolished or affected during dredging and embankment lining	-
Social Disturbance Concentration of workers and equipment, construction plants, temporary loading of materials and wastes, traffic disturbance, dusts and odour pollution etc. may disturb daily activities and the lives of the small number of eixisting local residents living a long the Tri river Conflicts may also be arisen if workers, waste, materials, equipment etc. are present outside the construction corridor	- Optimise construction duration schedule to maintain irrigation and drainage function but also minimising the impacts on the residents living along the river - Inform the community at least one week before construction is started - Monitor to ensure that physical disturbances are within the construction corridors only - Contractor recruit local labours for simple works, brief them about project environmental and safety requirements before started working - Contractor register the list of workers who come from other localities to the commune at the construction site - Led the water leaked from wet/damp dredged materials going back to the canal, not to affect garden or agricultural land - Keep the areas to be disturb minimal - Enforce workers to comply with codes of conducts
Landslide and soil subsiding risks at dredging area Relative deep excavation or cut and fills on the embankments that create slopes may lead to landslide and soil subsiding at the slops or excavated areas, particularly in rainy weather Deep excavation also cause risks to the existing buildings nearby, particularly the weak structures or located too close to the deep excavation area.	- During field survey for the preparation of CDMP, the contractor in coordination with the Environmental Officer of PMU and the Environmental Consultant of the CES identify weak structures that may be at risk and determine appropriate mitigation measures accordingly - Consider and select appropriate dredging method that allow minimising soil subsiding risks, for example carry out stepped excavation, stabilise slops in parallel to dredging - Apply protective measures such as sheet piles at risky locations
Water Quality Degradation Turbidity in water will be increased when the mud is disturbed; Water leaked from dredged material and suface runoff through disturbed ground also contain high solid contents. Muddy water entering irrigation ditch will cause sedimentation. Aquatic livest in the river would also be affected by turbid water.	- Build coffer dams surrounding the dredging area and pump the water out before starting dredging - If dredging is carried out directly onto the water, dredge at intervals to allow suspended materials to resettle before continuing. Observe water colour at 20 m upstream of the nearest irrigation water intake and stop dredging when water colour there started to change

Impacts and Description	Mitigation Measures
Increased Safety risk for the Public	- Place stable barriers along the construction corridor boundary to separate the site with nearby structures - Place warning signs and reflective barriers along the construction area, at dangerous locations and within sensitive receptors - Ensure adequate lighting at
Health and Safety risk to the workers The health of workers may be affected due to exposure to odour and other contaminants from sludge When working in or near Tri river, there is a risk of being drown Insects, reptiles such as bees, snakes from riverside bush may appear and attack the workers	- Provide and enforce the workers to use masks, gloves, boots, hats. If and when working in the water, protective cloths, lifevest must be worn. - Do not kill the insects/reptile, try to drive them away
Others	- Other relevant measures specified in ECOP or proposed by the contractors as necessary
MATERIAL LOADING AND TRANSPORTATION	
Dust and nuisance, traffic safety risks Dust or wet materials may be dropped along the transportation route	- Use water-tight tank trucks for transporting wet/dam materials - Cover the materials tightly before leaving the construction site - Do no overload material on the trucks
AT FINAL DISPOSAL SITE	-
Erosion,, Landslide risks at final Disposal site Although the excavated and dredged materials will be disposed of in the existing holes at the quarries, erosion due to strong wind may still happen if no measures are applied the high dumps of loose granular materials are formed. On the other hand, when the dump is high enough, landslide may happen under the impacts of wind and rainwater	- Level the materials after being disposed off - Slopes of the dumps will not be steeper than 45o - Build/create the walls to protect slopes - Create and maintain drainage surrounding each disposal area if the dumps make ground level higher than the surroundings
Disturbance to existing drainage Unloaded dredged and excavated materials may disturbed, damage or block the existing drains causing localised flooding	- Dispose of the materials at designated areas only - Clean up or repair existing drains if blockage or damages are the contractors' faults. Clean up and repair will be at cost of the contractors

ANNEX 3 – SAMPLING LOCATIONS



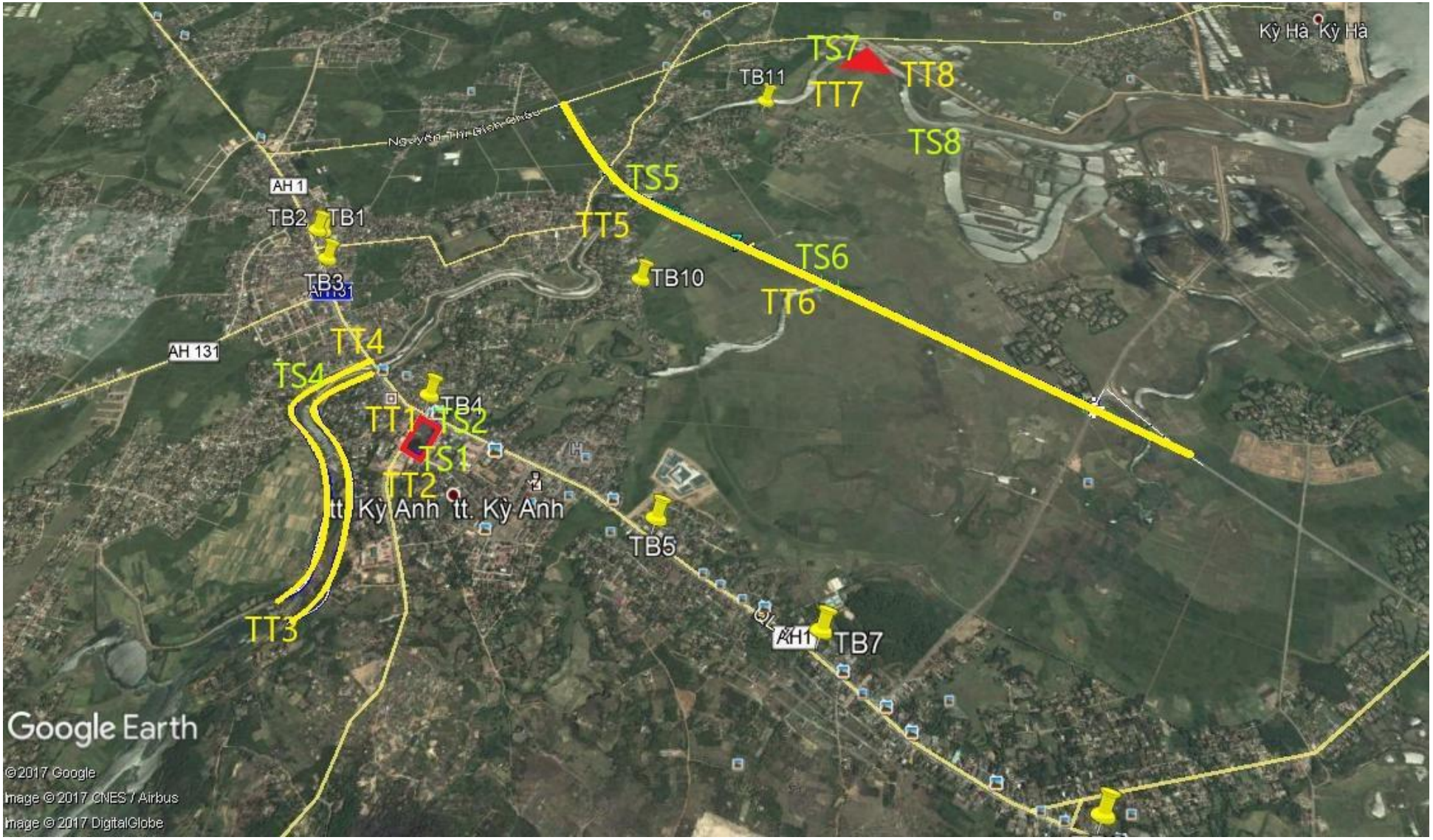

TS7
TT8
TB11
TT7
TS8
TS5
TT5
TB2
TB1
TB3
TB10
TS6
TT6
AH 131
TT4
TS4
TB4
TT1
TS2
TS1
TT2
tt. Kỳ Anh
TB5
TT3
AH1
TB7
Kỳ Hà
Google Earth
©2017 Google
Image © 2017 CNES / Airbus
Image © 2017 DigitalGlobe

Table 1. Ambient Air Quality

Sample symbol	Work	Sampling location
MK1	Thuy Son lake	Thuy Son lake near NH 1A
MK2	Embankment on Tri river	Tri bridge
MK3		Residential area on the left bank of Tri river
MK4		Residential area on the right bank of Tri river
MK5	Wastewater treatment system	At the right wind direction in the WWTP construction area
MK6		At the end wind direction in the WWTP construction area
MK11		Residential area in Tan Tien hamlet, Ky Hung commune
MK7	Main road	Junction with Nguyen Thi Bich Chau road
MK8		Culture house in Hieu Chau hamlet
MK9		Ky Chau kindergarten
MK10		Residential area at the end of the route

Table 2. Surface Water Sampling Locations

Sample	Location	Sample	Location
NM1	At the influent source to Thuy Son lake	NM7	At the construction area of wastewater treatment plant
NM2	Near residential area of Thuy Son lake	NM8	Tri river water, distanced 500m from the tentative construction area of the wastewater treatment plant toward the upstream
NM3	At middle of Thuy Son lake	NM9	Tri river water, distanced 500m from the tentative construction area of the wastewater treatment plant toward the downstream
NM4	Tri river spillway	NM10	Near Nguyen Thi Bich Chau street
NM5	Near Tri river bridge	NM11	At the tentative junction of the main road and Tri river (Ky Chau commune)
NM6	At the middle of Tri river embankment section	NM12	At the tentative junction of the main road and Cau Bau river

Table 3. Sampled Wastewater Quality

NT 1: Residential area on Le Quang Chi street
NT 2: Residential area on NH1A opposite to Thuy Son lake
NT 3: Residential area on the left bank of Tri river
NT4: Residential area of Tan Tien hamlet, Ky Hung commune
NT5: Residential area in center of Ky Trinh ward
NT6: Residential area in center of Ky Hoa ward

Table 4. Analysing Results of Groundwater Sample Quality

Groundwater sampling locations
NN 1: Residential area near Thuy Son lake (Mrs. Le Ti's house)
NN 2: Residential area on right bank of Tri river (Mrs Nguyen Thi Lam's house)
NN 3: Residential area on left bank of Tri river (Mr. Dang Van Toi's house)

NN4: Residential area in Hieu Chau hamlet (Mrs Le Thi Viet's house)

Table 5. Analysis Results of Soil Quality

Sample symbol	Work item	Sampling location
Đ1	Embankment on Tri river	Weir of Tri river
Đ2	WWTP	The area for construction of WWTP in Ky Hung commune
Đ3	Main road connecting urban centers	Agricultural land at the beginning of the route
Đ4		The intersection with district road 12a.

Table 6. Analysis Results on Sediment Quality

TT1: Thuy Son lake – near the residential area
TT2: Middle of Thuy Son lake
TT3: Weir of the Tri river
TT4: Near Tri river bridge
TT5: At the tentative junction of the main road and Tri river
TT6: At the tentative junction of the main road and Cau Bau river
TT7: At the construction area of WWTP
TT8: Tri river water, distanced 500m from the tentative construction area of the wastewater treatment plant toward the downstream