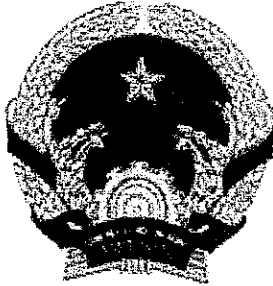


**GOVERNMENT OF SOCIALIST REPUBLIC OF VIET NAM  
MINISTRY OF TRANSPORT**



**Consulting Service for Detailed Design  
for  
Da Nang – Quang Ngai Expressway Development Project  
IDA Credit No. 3843-VN**

**Contract  
for  
Inundation Analysis of Quang Ngai Section of  
Da Nang – Quang Ngai Expressway  
Development Project  
(Lump Sum Contract)**

**BETWEEN**

**NIPPON KOEI CO., LTD**

**AND**

**DANISH HYDRAULIC INSTITUTE – VIETNAM (DHI-VN)**

**Dated: 29 November 2011**

*20/11*  
*[Signature]*

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**CONTRACT AGREEMENT**  
ON  
INUNDATION ANALYSIS OF QUANG NGAI SECTION  
FOR  
CONSULTING SERVICES FOR DETAILED DESIGN FOR  
DANANG - QUANG NGAI EXPRESSWAY DEVELOPMENT PROJECT  
PROJECT ID NO. P.106235  
IDA CREDIT NO. 3843-VN

This Contract made and entered into this 29 November 2011, by and between:

Nippon Koei Co., Ltd. duly organized and existing under the laws of Japan. with its principal office located in 4, Kojimachi 5-chome, Chiyoda-ku, Tokyo, 102-8539 Japan. (hereinafter referred to as the "Consultant") and DHI Vietnam Company Limited (DHI-VN), duly organized and existing under the laws of Vietnam, with its principal office located at Unit 303, 30 Nguyen Du Building, Nguyen Du Street, Hanoi, Vietnam (hereinafter referred to as the "Sub-consultant")

WITNESS THAT the parties covenant, promise and agree as follows:

The Sub-consultant agrees to do and complete the Inundation Analysis of Quang Ngai Section of Da Nang – Quang Ngai Expressway Development Project (hereinafter referred to as the "Works") in accordance with the terms, conditions and requirements of this Contract.


The Consultant agrees to pay the Sub-consultant in consideration of the fulfillment of the Works, the Contract Price of Twenty Five Thousand and twenty five US Dollar only (USD 25,025), including USD 2,275 of VAT, in lump sum, in accordance with the terms and conditions specified in Clause 2.12 of General Conditions.

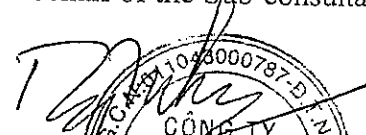
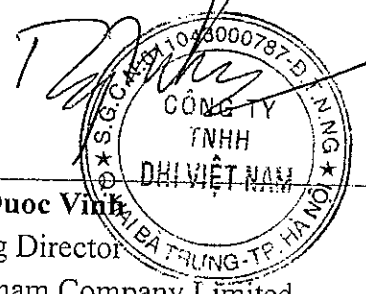
It is agreed that the terms, conditions and requirement of the Contract shall prevail to the extent that are expressly modified or altered by this Contract.

IN WITNESS WHEREOF, each of the parties hereto has caused this Contract to be executed in duplicate as of the date first above written by its duly authorized representative.

For and on behalf of the Consultant

For and on behalf of the Sub-consultant

  
\_\_\_\_\_  
**Ichizuru ISHIMOTO**  
Project Manager  
Nippon Koei Co., Ltd.

  
  
\_\_\_\_\_  
**Duong Quoc Vinh**  
Managing Director  
DHI Vietnam Company Limited

## II. GENERAL CONDITIONS OF CONTRACT

### 2.1 Definitions

The following words and expressions shall have the meaning assigned to them except where the context otherwise requires:

- (a) The "Client" shall mean Project Management No.85 (PMU85) under Ministry of Transport (MOT) of Government of Socialist Republic of Vietnam (GOV).
- (b) The "Project" shall mean Da Nang – Quang Ngai Expressway Development Project, approximately 140 km long, in the central Vietnam.
- (c) The "Service" shall mean the Consulting Services for Detailed Design for Da Nang Quang Ngai Expressway Development Project to be carried out by the Joint Venture.
- (d) The "Joint Venture" shall mean the Joint Venture of Nippon Koei Co., Ltd., Nippon Engineering Consultants Co., Ltd., Chodai Co., Ltd. and Thai Engineering Consultants Company Limited to supervise the Works at the Site(s) in Vietnam where the Contract has to be carried out. Whereas, the Joint Venture, was assigned by the Government of Vietnam to undertake the Consulting Services for Detailed Design for Danang - Quang Ngai Expressway Development Project.
- (e) "NK" shall mean Nippon Koei Co., Ltd., the prime consulting firm responsible for the implementation of the Service having an address of its head office at:
  - 4, Kojimachi 5-chome,
  - Chiyoda-ku, Tokyo, 102-8539, Japan
- (f) The "Project Manager" shall mean team leader of the Joint Venture approved by the Client.
- (g) The "Consultant" shall mean a person or persons of the Joint Venture appointed by the Project Manager.
- (h) The "Sub-consultant" shall mean the person whose bid has been accepted by the Consultant and approved by the Client.
- (i) The "Contract" shall mean the agreement between the Consultant and the Sub-consultant, and include General Conditions, Term of Reference (TOR), Technical Specifications and Priced Bill of Quantities (BOQ) attached hereto.
- (j) The "Site" shall mean the places of the area shown on the attached project location map in Appendix-A.
- (k) The "Works" shall mean the works for the Inundation Analysis of Quang Ngai Section of Da Nang – Quang Ngai Expressway Development Project as shown in

the Bill of Quantities attached in the Appendix E.

- (l) The "Contract Price" shall mean the sum named in the Contract as the Contract price.
- (m) The "Bill of Quantities" or "BOQ" shall mean the price schedule attached to the Contract.
- (n) The "Unit Price" shall mean the unit price stated in the Bill of Quantities.
- (o) The "Drawings" shall mean the drawings referred in the Contract and any modification of such figures and drawings approved in writing by the Consultant.
- (p) "Day, Week, Month, Year" shall mean calendar day, calendar week, calendar month and calendar year.
- (q) "Approval" or "Approved" shall mean approval or approved in writing by the Consultant.
- (r) "Writing" shall mean any manuscript, typewritten or printed statement under seal or hand. Words importing the singular only also include the plural and vice versa where the context requires. The fact that the words defined in this Clause are or are not capitalised in the Contract shall not affect their meaning.

## **2.2 Sub-consultant to Inform Himself Fully**

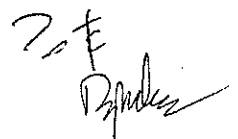
The Sub-consultant by bidding shall be deemed to have satisfied himself as to all the conditions and circumstances affecting the Contract price, and to have fixed these prices according to his own view for these as no additional allowances, except as otherwise expressly provided, will afterwards be made beyond the Contract Price. The Sub-consultant shall be responsible for any misunderstanding or incorrect information, whatsoever, obtained except information given in written by the Consultant. The Sub-consultant shall determine the presence of all services or ground facilities that may be affected by his work.

## **2.3 Time for Commencement and Completion**

The commencement date of the Works is 29 November 2011 and The whole of the Works shall be completed not later than 20<sup>th</sup> January 2012.

## **2.4 Manner of Execution**

- 1) The Works to be done under this Contract shall be executed in accordance with the Sub-consultant where not specified therein shall be in accordance with such instructions as the Consultant may issue from time to time as he considers necessary and appropriate. If something, which is not described in this Contract, occurred, the Sub-consultant shall consider and judge based on the conscience and justice of the engineership.



- 2) The Sub-consultant shall be responsible for observing all regulation and safety precautions required by authorities and/or through legislation.
- 3) The Sub-consultant shall keep good relation with concerned persons and organization of the Works and shall settle any conflict with them at his own responsibility and expense.

## **2.5 Information and Official Permission**

- 1) The Consultant shall make available to the Sub-consultant for the purpose of performing the Works which are listed in the Contract.
- 2) Official permission from the authorities concerned for the execution of the Works at the Site shall be arranged by the Sub-consultant at his own expenses.

## **2.6 Sub-consultant's Representative and Persons**

- 1) The Sub-consultant shall make his own arrangements for the engagement of all the engineers, technicians and labours necessary for the execution of the Works. The Sub-consultant shall submit to the Consultant for approval a complete list of principal staff showing names, functions, personal histories and periods of assignments prior to commencement of the Works.
- 2) The Sub-consultant shall appoint one or more competent representatives from the Sub-consultant's engineers assigned to the Works to superintend the carrying out of the Works on the Site. The names, training and experience of the Sub-consultant's representatives shall be submitted to the Consultant for approval before they are appointed. The said representative, or if more than one shall be appointed, then one such representative shall be present on the site during working hours, and any orders or instructions which the Consultant may give to the said representative of the Sub-consultant shall be deemed to have been given to the Sub-consultant by the Consultant.
- 3) The Sub-consultant shall be responsible for observation of all regulation and safety precautions imposed by labour legislation and authorities in Vietnam. The Sub-consultant shall prepare a safety policy document for submission to the Consultant for approval prior to starting work on the site. No work will be allowed to proceed until this document has been submitted and approved. Any costs delay due to the late submission of this document will be at the Sub-consultant's expense.
- 4) The Consultant shall be at liberty by notice in writing to the Sub-consultant to object to any representative or other person employed by the Sub-consultant in the execution of the Works who shall, in the opinion of the Consultant, misconduct himself or be incompetent

or negligent or be sick and the Sub-consultant shall remove such person from the Works and provide an acceptable replacement for such person at the Sub-consultant's expense.

## **2.7 Working Days and Hours**

The Sub-consultant shall carry out the Works on the Site and in their offices continuously during the normal working hours generally recognised in Vietnam. The Sub-consultant may, with the arrangement of the Consultant, carry out work at other time if it shall be practicable in the circumstances for work to be so done.

## **2.8 Materials, Equipment and Facilities to be provided by the Sub-consultant**

The Sub-consultant shall, at his own expense, supply and provide all the equipment, materials, labors and other things or every kind required for the execution and completion of the Works.

## **2.9 Program to be Furnished**

- 1) The Sub-consultant shall submit to the Consultant for his approval his proposed time schedule and field operation program for each section of the Works.
- 2) After approval by the Consultant of such time schedule and field operation program, the completion time for the Works stipulated in the same time schedule shall be considered as "Guaranteed Time for Completion of the Works", and the Sub-consultant shall adhere to the order of procedure method and time schedule unless he obtains the written permission of the Consultant to vary such order or method or time schedule.
- 3) Such time schedule and field operation program shall be supplemented by the Sub-consultant in weekly progress reports indicating the actual state of progress of all items during the course of the Works at the Site. The form and substance of such weekly reports shall be satisfactory to the Consultant. The weekly progress report shall be submitted by Monday of the following week to which it applies.
- 4) In the course of the Works, when the Consultant calls the Sub-consultant for a meeting, the Sub-consultant and/or his representatives shall at any time and at his own expense attend the meeting and shall report the actual state of Works.

## **2.10 Insurance**

- 1) The Sub-consultant shall at his expense effect accident and insurance for engineers, technicians and labours employed by the Sub-consultant for the execution of the Works, and shall indemnify the Consultant from any claim for the compensation of such accident and injury, damage to property and third parties caused in undertaking the duties and all claims whatsoever.

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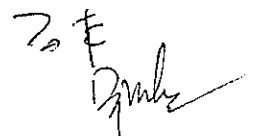
- 2) The Sub-consultant shall, at his expense, insure the equipment, materials and facilities to be provided by the Sub-consultant and keep each part thereof insured for its full value against loss, damage and fire.

### **2.11 Force Majeure**

- 1) If either party is temporarily unable by reason of force majeure or the law or regulation of to meet any of its obligation under the Contract, and if such party gives to the other party written notice of the event within fourteen (14) days after its occurrence, such obligations of the party, as it is unable to perform by reason of the event, shall be suspended for as long as the inability continues.
- 2) Neither party shall be liable to the other party for loss or damage sustained by such other party arising from any event referred to in Clause 2.11 1) or delay arising from such event.
- 3) The term "Force Majeure" as employed herein shall mean Act of God, strikes, lock-outs or other industrial disturbances, acts of the public enemy, wars, blockades, earthquakes, storm, lighting, floods, washouts, civil disturbances, explosion, curfews, and any other similar event, beyond the control of either party.

### **2.12 Terms of Payment**

- 1) This is a lump sum contract.
- 2) As soon as the Works has been started, the Sub-consultant shall submit to the Consultant, the invoices of amount payable. After checking the invoices, the Consultant shall pay the Sub-consultant in respect of the Works. The Consultant reserves the right to exclude such items that are not considered to be authenticated, from the payment.
- 3) Advance payment equivalent to Forty percent (40%) of the Contract Price shall be made to the Sub-consultant after approval by the Consultant for the following items:
  - Completion of mobilization of personnel and equipment at the Site.
  - Work plan.
- 4) Interim payment equivalent to Forty percent (40%) of the Contract Price shall be made to the Sub-consultant upon acceptance of the outcome by the Consultant.
- 5) Final payment equivalent to Twenty percent (20%) of the Contract Price shall be made to the Sub-consultant upon issuance of "Work Completion Certificate" by the Consultant after receiving the acceptance letter by PMU85.



- 6) No extra payments in respect of overtime, holiday work, additional equipment, materials and facilities, or special conditions of hardship shall be claimed by the Sub-consultant beyond the Contract price.
- 7) Payment procedure is provided in Appendix-B. Remittance charge shall be paid by the Sub-consultant.

### **2.13 Taxes and Related Charges**

All the income and other taxes, levies, imposes, deductions, charges, fees and similar assessments whatsoever imposed, assessed, levied or collected by the Government of Vietnam or any subdivisions thereof or any taxing authority therein, upon the Sub-consultant and his staff shall be paid and/or borne by the Sub-consultant.

### **2.14 Variations and Omissions**

- 1) The Sub-consultant shall not alter any of the Works except as directed in writing by the Consultant. The Consultant shall have full power, from time to time, during the execution of the Contract, to direct the Sub-consultant to alter, amend, omit, add to or otherwise vary any of the Works, by notice in writing, and the Sub-consultant shall carry out such variations. In case the Consultant asks the Sub-consultant, on the spot, to change the areas to be investigated from the originally proposed areas, the Sub-consultant shall at that instance obey such directions and later obtain written confirmation from the Consultant.
- 2) If a decrease in the Works is ordered by the Consultant, such orders shall not constitute any ground for claim for damage or loss of anticipated profits on the Works. All extra additional Works shall be performed with the same materials and workmanship as employed for the Works of similar character in the original one as far as they are applicable thereto.
- 3) In case some modification and/or variation are requests made by Consultant and/or Client, those works shall be paid by Consultant basing on the unit price in BOQ and the actual quantity. In case such modifications and/or variations requested are not included in the BOQ, both Parties will discuss to make a supplementary agreement to the Contract.

### **2.15 Sub -consultant's Default**

- 1) If the Sub-consultant shall neglect to execute the Works with the diligence and expedition or shall refuse or neglect to comply with any reasonable instructions or orders given in writing by the Consultant in connection with the Works, or shall contravene the provisions of the Agreement, the Consultant may give notice in writing to the Sub-consultant to make good the failure, neglect or contravention complained of.

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- 2) In case, the Sub-consultant fail to comply with the notice within a reasonable time from the date thereof, then and in such case the Consultant shall be at liberty to employ other workmen and forthwith execute such part of the Works as the Sub-consultant may have neglected to do, or, if the Consultant shall think fit, it shall be lawful for him, without prejudice to any other right he may have under the Contract, to make the Works wholly or in part out of the Sub-consultant's hands and re-contract with any other person or persons to complete the Works or any part thereof.
- 3) The Consultant shall be entitled to retain and apply any balance which may be otherwise due by him to the Sub-consultant, or such part hereof as may be necessary to payment of the cost of executing the said part of the Works of completing the Works as the case may be. If the cost of completing the Works or executing part thereof as aforesaid shall exceed the balance due to the Sub-consultant, the Sub-consultant shall pay such excess upon request writing from the Consultant.

#### **2.16 Rejection**

If at any time before the Works are accepted by the Consultant, the Consultant shall decide that any work done by the Sub-consultant is defective or not in accordance with the Sub-consultant or that the Works or any portion thereof are defective or do not fulfil the requirements of the Contract, then the Sub-consultant shall with all speed and at his own expense make good defects so specified. In case the Sub-consultant shall fail so to do, the Consultant may, provided he does so without undue delay, take at the cost of Sub-consultant, such steps as may in all the circumstances be reasonable to make good such defects.

#### **2.17 Time for Completion**

- 1) The whole of the Works shall be completed with the time guaranteed by the Sub-consultant or such extended time as may be allowed under the following paragraph.
- 2) The Sub-consultant shall not be held responsible for failure to carry out his obligations in case of force majeure, such as embargo, blockade, war, natural disasters or any disaster or any circumstances beyond his reasonable control.
- 3) The Sub-consultant shall notify the Consultant in writing within seven (7) days of the commencement of force majeure conditions. Depending on the production of satisfactory evidence and if the existence of force majeure conditions is accepted by the Consultant, the Consultant will grant extension of the Guaranteed Time for Completion of the Works sufficient to compensate for delay due to force majeure without penalty.

## **2.18 Delay in Completion**

If the Sub-consultant fails to complete the Works in accordance with the Contract within the time fixed by the Contract, there shall be deducted from the Contract Price as and for liquidated and ascertained damages a sum of money equal to a half percent (0.5%) of the Contract Price for each day between the Guaranteed Time for Completion of the Works and the actual date of completion but the amount so deducted shall not in any case exceed five percent (5%) of the Contract Price. Such deduction shall be in full satisfaction of the Sub-consultants liability for the said failure. The Consultant may request the Sub-consultant to employ additional labour or use additional equipment and materials and the Sub-consultant will do so at his expense in case a delay in the completion of the works has to be expected.

However the above penalty for delay in completion is not applied in case such delay resulted from time delivery and quality of data provided by Consultant to Sub-Consultant for Works completion, if such case is happened, the Consultant and Sub-Consultant will discuss diligently for find resolved solution to complete the Works in-time which still satisfactorily to both sides.

## **2.19 Suspension of the Works**

The Sub-consultant shall, on the written order of the Consultant, suspend the progress of the Works or any part thereof for time or times and in such manner as the Consultant may consider necessary and shall be doing such suspension properly protect and secure the works so far as is necessary in the opinion of the Consultant. All expenses incurred by the Sub-consultant by reason of the suspension of the Works by the Consultant will be at the sole responsibility of the Sub-consultant if the suspension is:

- (a) Otherwise provided for in the Sub-consultant
- (b) Necessary for the proper execution of the works or by reason of whether conditions affecting the safety or the quality of the Works or by some defaults on the part of the Sub-consultant, or
- (c) Necessary for the safety of the Works or any part thereof.

## **2.20 Certificate of Completion of the Works**

As soon as in the opinion of the Consultant, the whole of the Works shall have been satisfactory completed, the Consultant shall issue a Certificate of Completion of Works after receiving a written application thereof. Upon issuance of such Certificate of Completion of Works, the Sub-consultant shall cease to be under further obligation under the Contract.

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When whole the Work completed, a Certificate of Completion of Works shall be issued to terminate the Contract after receiving the acceptance letter from PMU85.

### **2.21 Bankruptcy**

If the Sub-consultant shall become bankrupt or insolvent or have a receiving order made against him, or compound with his creditors, or being a corporation, commence to be wound up, not being a member's voluntary winding up for the purpose of amalgamation or reconstruction, or carry out its business under a receiver for the benefit of its creditors or any of them, NK shall be at liberty:

- 1) To terminate the Contract forthwith by notice in writing to the Sub-consultant or to the receiver, or liquidator, or to any person in whom the Contract may become vested, and to act in the manner provided in Clause 2.15 of the Sub-consultant's Default, as though the last mentioned notice has been the notice referred to in such Clause and the Works has been taken out of the Sub-consultant's hand, or
- 2) To give such receiver, liquidator or other person the opinion of carrying out the Contract subject to his providing a guarantee for the due and faithful performance of the Contract up to an amount to be agreed.

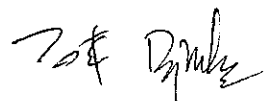
### **2.22 Assignment and Sublet the Contract**

The Sub-consultant shall not, without the prior consent in writing of the Consultant, assign or transfer the Works or the benefits or obligations thereof or any part thereof to any other persons. The Sub-consultant shall not, without the prior consent in writing of the Consultant, which shall not be unreasonably withheld, sublet the Sub-consultant any part thereof or make any sub-contract with any person or persons.

Any such consent if given shall not relieve the Sub-consultant from his obligations under the Contract. The Sub-Sub-consultant shall be regarded as employee of the Sub-consultant. The Sub-consultant shall be solely responsible for the performance of the Sub-Sub-consultant and for all payments to the Sub-Sub-consultant.

### **2.23 Arbitration**

- 1) If any dispute or difference of any kind whatsoever shall arise between NK and the Sub-consultant in connection with the interpretation or application of the Contract, it shall be settled as much as possible by amicable arrangement between both parties. If such arrangement cannot be realised, the dispute of difference shall be settled by arbitration as provided herein.



- 2) All questions, disputes or differences arising out of or in relation to the interpretation of the Contract which cannot be settled by mutual accord shall be submitted to a committee for arbitration consisting of three arbitrators, one to be nominated by NK, another by the Sub-consultant and the third as chairman by the two mentioned arbitrators above, and shall be finally settled in conformity to the rules and procedures of Conciliation and Arbitration of the International Chamber of Commerce. Such arbitration shall be held at such place and time as the arbitrators may decide. Any decision, opinion, direction, certificate or valuation given by the arbitrators shall be obeyed by both parties and be final.

#### **2.24 Notice and Correspondence**

Any notice to be given to the Sub-consultant shall be served by sending the same by post, facsimile, email, or leaving the same at the Sub-consultant's principal place of business, or to the address of his representative at the Site. Any notice to be given to the Consultant shall be served by sending the same by post, facsimile, email, or leaving the temporary site office of the Consultant in Danang, or to NK address as stated in the Contract.

#### **2.25 Documents**

- 1) All the correspondences, figures, drawings and other documents shall be made in both English and Vietnamese.
- 2) The several documents have to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies the same shall be adjusted in accordance with the provisions of Clause 2.23 thereof.

#### **2.26 Inspection of Work**

The Consultant shall, at all times, have access to the Works wherever it is in preparation or progress and the Sub-consultant shall provide necessary facilities for such access and for inspection. Where the specifications require any work to be specially tested or approved, the Sub-consultant shall give the Consultant timely notice of his readiness for inspection and, if the inspection is by an authority other than the Consultant, of the date fixed for such inspection.

#### **2.27 Maintenance of Security**

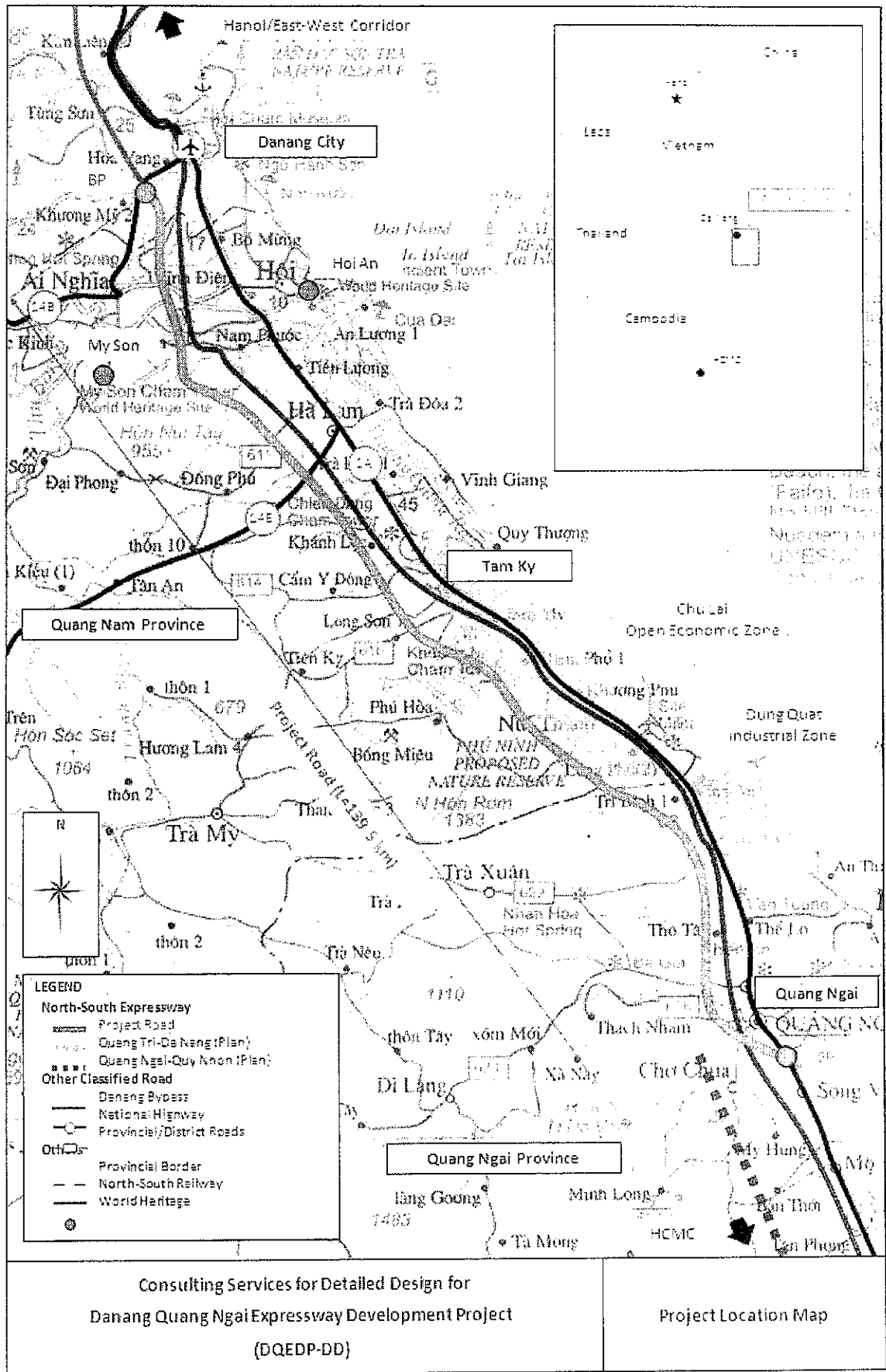
Without obtaining the Consultant's prior written approval, the Sub-consultant shall not disclose, not only during the effective period of this Contract, but also after the termination or completion of this Contract, any information and/or data, etc., which has been made known to the Consultant in executing the Work.

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## 2.28 Emergency Communication Network

The Sub-consultant shall submit to the Consultant an emergency communication network which includes contact numbers and addresses in both case of usual and emergency response.

*Z. F. Dymally*



Consulting Services for Detailed Design for  
 Da Nang Quang Ngai Expressway Development Project  
 (DQEDP-DD)

Project Location Map

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### Appendix-B: Mode of Payment

- A. The Sub-consultant shall submit an invoice for services performed by him/her. A sample invoice form is attached hereto.
- B. The above invoices shall be submitted to NK with the following particulars:
- Address : Mr. Ichizuru Ishimoto  
General Manager  
Highways and Bridges Dept.,  
Nippon Koei Co., Ltd.  
Tokyo, 102-8539, Japan
- Project Code : JA08O1057
- C. The payment shall be made in US Dollar of telegraphic transfer to the account mentioned below within one (1) month from the date of the receipt of the invoice. The Sub-consultant shall confirm in advance the reliability of transferring to this account.

Bank Name : \_\_\_\_\_  
Branch Name : \_\_\_\_\_  
Account Name : \_\_\_\_\_  
Account Number : \_\_\_\_\_  
Bank Address : \_\_\_\_\_  
Country : Vietnam  
(where the bank exists):

- D. Remittance charges shall be deducted from the amount of each payment.

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## Section 5. Terms of Reference

### 1. Background

The Government of the Socialist Republic of Vietnam (GOVN) represented by Vietnam Expressway Corporation, through Project Management Unit No. 85 (PMU85) is planning to implement Expressway Development (Da Nang - Quang Ngai) Project (hereafter called the Project). Vietnamese MOT is the line agency who makes investment decision for the Project. VEC is the project owner and PMU85 is the project management consultant at project preparation and implementation phases until the works is handed over and put into operation. PMU85 is also the implementing agency who actively works with relevant authorities to solve all the issues related to the Project. The purpose of the Expressway is to improve the inter-regional transport networks to support the socio-economic development in the Central region and in the whole country and promote traffic safety.

In preparation for the Project, the GOVN commissioned a Feasibility Study (FS) in 2003 which was subsequently revised and completed in March 2008 by JETRO Consultants. In order to meet the requirements of the guidelines and loan procedure of the World Bank and other international financial donors, the FS was updated by Nippon Koei Co., Ltd. being completed in May 2009. This updated FS is being reviewed and further refined by CPCS Transcom Limited.

The Project consists of the following three components;

- (1) Component A: Civil Works  
Construction of four-lane dual carriageway road (with capacity for eventual widening to six lanes) and 131 km in total length.
- (2) Component B: ITS (Intelligent Transport System) Works  
Provision of traffic management and toll collection facilities
- (3) Component C: Expressway Operations and Maintenance  
Planning an institution to operate and maintain the expressway and identifying facilities and equipment that it will need.

It is currently expected that the project will be implemented with financial support from the World Bank and the Japan International Cooperation Agency (JICA). Funds from these agencies would be used to finance separate sections of the Project. The current Terms of Reference pertain to the entire Project.

### 2. Objectives of the Consulting Services

The objectives of the consulting services are:

- To undertake the efficient and proper preparation of the detailed engineering design;
- To prepare an implementation program that can ensure delivery of the project in an efficient and timely manner infrastructure in accordance with the implementation program; and
- To promote technology transfer by employing suitably qualified Vietnamese professionals for the detailed design and implementation planning for the Project and by providing appropriate training for staff of the related agencies who will be at various times responsible for the Project.

### 3. Scope of Services

#### 3.1 General

In executing the services, the Consultant shall follow the current relevant Guidelines and regulation/procedures of GOVN and the Bank based on the FIDIC Conditions of Contracts. The Consultant shall assist PMU85/MOT in all aspects of the work including the review of previous studies, detailed design and tender assistance required for implementation of the Project. The scope of the consulting services broadly consists of, but not limited to, the following works:

1. Review of previous studies.
2. Detailed engineering design including cost estimation and preparation of tender documents and other supporting documentation.
3. Assistance with calling and assessing tenders for works and for contract negotiations.

Special attention is drawn to the requirement that the Consultant conduct independent bid evaluations and give the Client advice on issues related to contract negotiations for the Client's reference.

The Consultant shall perform the tasks listed below:

#### 3.2 Review of Previous Studies and Establishing the Detailed Design Framework

The Consultant shall:

(1) Review Previous Studies

The Consultant shall review the previous studies to acquaint themselves with the evolution of the Project and its current features, and to identify matters that may materially affect the work of the current contract. Key issues will be identified for discussion and agreement with PMU85/MOT. The review shall cover, among others, the following subjects:

- a. Review of horizontal and vertical alignment and proposed structures.
- b. Review site-specific social and environmental impacts identified in the Environmental Impact Assessment (EIA) prepared by PMU85 and the mitigation measures proposed in the associated Environmental Management Plan (EMP).
- c. Review construction phasing and management of traffic during construction.
- d. Review toll operation and control facilities, operation and maintenance facilities and services, service areas, parking areas, etc.

(2) Establish Detailed Engineering Design Framework

The Consultant shall:

- a. Establish design criteria and design standards to be applied for the Project.
- b. Recommend and agree with PMU85/MOT the format and content for the Bills of Quantities, cost estimates and prequalification and bidding documents.
- c. Recommend and agree with PMU85/MOT the time schedule for preparation of the detailed design, the Bills of Quantities, cost estimates, prequalification documents and bidding documents to allow the tendering

of works and construction for each contract package to commence immediately after the completion of necessary design and documentation work and the gaining of necessary approvals.

### **3.3 Detailed Engineering Design and Procurement Planning**

Tasks to be undertaken by the Consultant to prepare the detailed engineering design and the planning of procurement will include:

1. Identify project packaging.
2. Conduct surveys and investigations.
3. Prepare detailed design for roads, bridges and other structures.
4. Design of intelligent transport systems and toll facilities.
5. Establish an operation and maintenance system for the project.
6. Prepare an Environmental Impact Assessment, Environmental Management Plan, Ethnic Minority Development Plan (if needed) and Resettlement Action Plan.
7. Recommend construction methods and prepare a construction schedule.
8. Prepare a cost estimate for the Project.
9. Prepare pre-qualification, tender and contract documents.
10. Prepare an implementation program.

In undertaking the detailed engineering design, the Consultant shall:

- a. Use the reference documents of previous studies approved by GOVN and the World Bank as the basis for detailed design.
- b. Use engineering standards approved by GOVN. Where current standards are not available or are unsuitable, the Consultants shall make recommendations for appropriate standards and gain approval from PMU85/MOT for their use.
- c. Undertake the work in a phased manner so that pre-qualification of contractors can occur for packages for which detailed design and documentation is completed while detailed design and documentation continues for other packages.

#### **3.3.1 Packaging**

The Consultant shall identify a recommended packaging for the project and get agreement with the Client before commencing detailed design. Packaging shall satisfy the following conditions:

- a. Individual packages should be confined to a single province;
- b. Individual package shall be financed by only a single financier;
- c. The value of a package should generally be from about 70 million to 100 million USD, i.e. neither too big nor too small.
- d. During D.D preparation, the Consultant shall study, initiate the solutions and design a contract package with reasonable scopes of works beforehand so that its construction can be commenced in 2010.

#### **3.3.2 Surveys and Investigations**

##### **(1) Data collection**

- Investigate and collect the following data for cost estimate and general cost estimate:  
Production costs related to local transportation activities; depreciation regulations related

to traffic vehicles; haulage tables for transportation services; charges for travel, bridges and roads, and insurance; costs for traffic accidents; inflation and exchange rate in the previous years; local unit price for calculation of general cost estimate; consult unit prices of projects under implementation in the region; investigate sources of materials and energies for construction; cooperate with local governments to identify disposal areas for soil and waste materials ( including liquid waste)

- Survey for construction material transportation

- Investigate and collect planning data related to the project and work with relevant authorities: Collect planning maps of highways, railways, waterways and maritime; plan of industrial and urban zones along the route; plan of systems of hydraulic works , irrigation, canals, dykes, and pumping stations, etc; plan of underground works and system of underground and overhead lines; Plan of water supply and drainage system; plan of electricity supply and lighting; plan of communication system and other relevant plans along the route. etc ( the plans must be granted with official approval of relevant authorities)

- Collect project documents and design document of the relevant projects

- Work and agree in writing with relevant authorities of Da nang city, Quang Nam and Quang Ngai provinces, 5<sup>th</sup> military zone under Ministry of Defense, EVN, VNPT, PMU of industrial zones and other relevant managing agencies about the following contents: Alignments: alternative design of interchange; scale and location of toll plazas, control center, service stations; elevation of detailed plans of urban zones and industrial zones; location, span or width, and elevation of culvert and frontage road; navigational clearance, railway clearance; documents related to hydraulic works, irrigation, water sources and sewage system for urban zones, clearance of large canals and dykes; areas within military structures, military barracks; and the other relevant documents, etc.

## (2) Surveys

Implement detailed surveys served for engineering designs of all work items under the project including: surveys of topography, hydrology, geology and testing, material sources, traffic issues, electricity, land acquisition and resettlement, surveys of relevant underground and overhead structures and staking land acquisition, etc .., and additional survey quantities (if any) during the design. The surveys must comply with current Vietnamese specifications and standards, and supply sufficient data for documentation of detail engineering designs. Before implementation of surveys, the Consultant must carry out thorough studies on existing documents and data in the previous stages (FS, JETRO). Based on the findings from the studies, the Consultant makes and submit detailed plans for VEC's approval to implement. Scope of the work are mainly, but not limited, as follows:

### (i) Topographic survey

- Class IV primary control points (national coordinate system VN2000): Installed with GPS technology, mark specification is in accordance with standard 22 TCN 263-2000. Each mark's distance is about 3-4 km along the expressway route, and at least 4 marks/ point at points of intersection and large bridges such as Ky Lam, Tam Ky.... and at least 2 marks/ point for the other interchanges and bridges. The marks along the route and at the large bridges and interchanges should be arranged reasonably to avoid overlapping.

- Class IV leveling network: Installed with highly accurate geometric leveling equipment. Marks of IV class leveling network share same positions with those of IV class primary control points. Its errors are varied within standard 22 TCN 263-2000.

- Secondary control point (traverse net): measured with electronic tachometer which has accuracy and errors according to standard 22 TC 263-2000. Each mark's distance is about 150m-200 m/1 point along the expressway route, and at least 8 marks/ point for points of interchange and large bridges and at least 4 marks/ point for the other interchanges and bridges. The marks along the route and at the large bridges, interchanges should be arranged reasonably to avoid overlapping.
- Technical leveling network: Marks of technical leveling networks share same positions with those of secondary control point. It is measured with highly accurate geometric leveling equipment. Its accuracy and error is in line with standard 22 TCN 263-2000.
- Site planning: According to the alignment determined in FS, a site plan at scale of 1/1000 is made along the route, with measurement range in the expressway from center line to sides of 70 m and that in level crossing (traverse) from center line to sides of 50 m. The site plan is required to have full description of topography, ground objects, underground and surface structures, high voltage and low voltage lines; ground communication lines, railway signals, location of lakes and ponds, system of irrigation and canals, special ground objects, historical site, temples, pagodas, feretories, cemeteries, and administrative land boundary, etc as well as GPS marks, and secondary control points.
- Detailed stakeout works: According to the above site plan at scale of 1/1000, alignment design must comply with the specification and is agreed with relevant authorities (locality, military, etc). Based on system of secondary control points, official setting out in the field includes: top marking, marking in the curve, main stakeout in TS, TC, P, ST, CT; and detailed stake arrangement with max. distance of lower than 20m/ stake, and main stakes in the curve and in changed terrains and stakes of ground objects, culverts, control stakes, locations in planned industrial and urban zones (focusing on starting points and ending points) boundary of communes and districts, etc. Main stakes at top of curves, in TS, TC, P, ST, CT, Km, culverts, bridges, intersection, etc must be concreted according to standard 22 TCN 263-2000.
- Survey of longitudinal section at horizontal scale of 1/1000, and vertical scale of 1/100.
- Survey of cross-section at scale of 1/200. Surveying range is 70 m from center line to both sides of the expressway.
- Survey of culverts for drainage: Planimetric survey of the culverts with span (width) of more than 1.5m is at scale of 1/500 at the culverts, and axial measurement range of 100 m and horizontal one of 100 m for each side. The axial survey of dyke's center line, horizontal survey of dyke, and road crossing at all points of dyke's center line are at scale of 1/200. Surveying range includes range of planimetric survey of the culverts. Intersection angle is surveyed between road and culvert center lines. It is necessary to agree in writing with the relevant agencies on irrigation culverts.
- Survey of intersection points with the other works such as railways, high-voltage and low-voltage lines, communication lines including phone lines, electricity and lighting structures, post and communication cables and underground structures in the expressway routes consists of the following works: measurement of height of rail top at the intersection points with the existing routes; investigation of planned elevation of crossroad, if any; survey of elevation and locating alignment and electrical poles ( by coordinate), survey of at least two adjacent poles, intersection angle between lines and perpendicular lines, distance from the center line to the poles, height of the poles, clearance between the lowest lines and natural surface; and survey of kinds of poles, electricity, cables, pipeline, electric transmission grid, managing agencies.

- Survey of interchanges: Identify crossroad intersecting with designed route (coordinate, station); identify the intersection angle, width of road base, kind of pavement, existing structure, kinds of vehicle, etc in the interchanges; stake out concrete/ iron piles at centerlines, starting points, ending points, top points, and basic points in the curve; make site plan with scale of 1/500 with measurement range within designed interchange range; survey longitudinal section of interchanges and its branches with length scale of 1/1000 and height scale of 1/100; survey cross-section of interchange at scale of 1/200 and distance from centerline to each side of 50m, and survey range is equal to site plan one.
- Survey of bridge: Make elevation plan at construction place of bridge at scale of 1/500; survey profile of bridge at scale of 1/500 at center line of the expressway; stake center line of the bridge with accuracy equivalent to that of secondary control points (it is noted to collect hydrographic and hydraulic data, and the documents agreed with local authorities on plan of rivers, dykes and hydraulic works. It is necessary to survey meteorological data such as: temperature, wind, rainfall, humidity, earthquake, and figures of flow rate, velocity and water level.
- Survey of residential underpass culverts: Make plan at scale of 1/500 with distance from center line to two sides of 200m and 100m respectively along the main route; survey longitudinal section at center line of residential underpass culverts at scale of 1/500, surveying distance from the centerline to each side of 100 m; survey cross section at distance from the centerline to each side of 30 m at scale of 1/200; survey the intersection angle between the interchange and the main route; survey kinds of intersection ( district ones, commune ones, and ward ones), scale and plans ( if any). Survey profile of intersection at scale of 1/500, at distance from the expressway's centerline to each side of 200m, and survey cross section of intersection at scale of 1/200 from the intersection's centerline to each side of 30m.
- Survey of canals and dykes: Identify location and boundary of canals and dykes; set plan at scale of 1/500 in boundary of canals and dykes; survey longitudinal section of canals and dykes at scale of 1/1000, and their height at scale of 1/100; survey their cross section at scale of 1/100, at distance from their centerline to each side of 20m.
- Survey of toll plazas, control centers, service station, expressway management offices, bus station, communication stations: Establish area control points equivalent to secondary control points; survey topographic plan at scale of 1/500.
- Survey and investigation of land acquisition and resettlement.

(ii) Survey of hydrographical data

- Collect meteorological and hydrographical data related to rainfall, wind, and temperature, humidity from meteorological stations, and flow rate and water level at hydrographical stations in rivers in the project area.
- Collect relevant documents and work with Ministry and provincial departments of agriculture and rural development to agree with bridge designs. In terms of the culverts over irrigation systems, it is necessary to work with relevant authorities and local governments to gain agreement on culvert location, width, and required elevation from its bottom.
- Survey water level along each 1 km distance of the expressway, forming 1 water level group (each water level includes: highest one, frequent one, average one, and lowest one in 3 consecutive years; survey causes and period of flood....For drainage culverts, survey water level groups (each water level includes: highest one, frequent one,

average one, and lowest one in 3 consecutive years). Survey year and causes of flood. Illustrate surveyed water level groups in the site plan.

- Survey situation of existing drainage works, irrigational system along and through the route, identify existing cross-section of canals and dykes, their top width, bottom width, depth, bottom elevation, functions, flow direction and longitudinal slope, and mark at their side.
- Survey fully existing situation of drainage, utility purposes and managing agencies of irrigation systems along and through the route.
- Hydrologic survey of bridge: Measure cross-section of flow; survey the water level in form of 3 groups at each location of bridge including: highest one, frequent one, average one, and lowest one in 3 consecutive years, causes and duration of flood.
- Hydraulic and hydrologic calculation: Based on survey data, carry out hydrologic calculation for the engineering design such as designed water level along the route, and hydraulic and hydrologic calculation of bridges and culverts (flow rate, velocity, and water level, general and local scour).

(iii) Engineering geological survey:

Deleted here under....

## APPENDIX D: SPECIFICATIONS

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## SPECIFICATIONS

### 1. General

The Technical Specifications mentioned hereunder has been designed in order that the Sub-consultant shall carry out the Inundation Analysis of Quang Ngai Section of Da Nang – Quang Ngai Expressway Development Project which covers an approximate length of 41km.

### 2. Objectives of the Work

The objectives of the Work are: to identify the inundated sections of expressway alignment, to determine design water levels on the inundated sections of the expressway alignment, to optimize the openings of the drainage structures in the expressway for smooth flow flood water during high flood and to develop depth and duration flood maps of rivers and their floodplains.

### 3. Location of the Work

The proposed expressway starts from Da Nang City and passes through Quang Nam Province and ends at Quang Ngai Province covering about 140 km length.

However, the Sub-consultant should perform inundation analysis of Quang Ngai section of Da Nang – Quang Ngai Expressway Development Project. Detailed on work to be covered by inundation analysis shall be provided by the Consultant to Sub-consultant timely.

### 4. Scope of the Work

The Sub-consultant shall carry out the inundation analysis of Quang Ngai section of Da Nang – Quang Ngai Expressway Development Project as stipulated in Terms of Reference (TOR) of the consulting service and is summarized in the other section.

The Works covered by the Specification includes furnishing all technical staffs, engineers, equipment and software required to perform the inundation analysis of Quang Ngai section of Da Nang – Quang Ngai Expressway Development Project.

Quantity of the Works shall be as specified in Bill of Quantities (BOQ).

### 5. Datum for Coordinates and Elevation

The following datum shall be applied to the coordinates and elevation.

#### (1) Coordinates:

National Coordinate System (VN2000)

Ellipsoid: WGS84

Projection: Transverse Mercator (Zone width: 3 degrees)

Central Meridian: 108.00.00 East

Scale Factor:  $K=0.9999$

(2) Elevation:

National Elevation System (Hon Dau Island, Hai Phong)

## 6. Unit of Measurement

Unit of measurement shall be the metric system.

## 7. Language

All correspondences, figures, drawings and reports shall be made in both English and Vietnamese.

## 8. Work Plan

The Sub-consultant shall submit the draft Work Plan not later than 7th December 2011 for the checking by the Consultant.

The Work Plan shall include:

- (a) Legal bases
- (b) Technical standards to be followed
- (c) Work schedule
- (d) Organization chart and member list of all experts and technicians along with their CVs and academic certificates to be assigned for the work
- (e) Emergency communication network
- (f) List of equipment to be used with certificates and photos
- (g) Proposal for collection of hydro-meteorological and GIS data necessary for developing inundation model
- (h) Technical proposal to perform the works mentioned in the Terms of Reference (TOR) for consulting service
- (i) Formats of data and inundation model's results
- (j) Others

## 9. Technical Standards to be Referred

The Inundation Analysis shall be carried out in accordance with the stipulation in the TOR with reference to the following Vietnamese standards. In case, the Sub-consultant would find any discrepancy between the TOR and Vietnamese standards, the Sub-consultant shall immediately report it to the Consultant for further direction. The following Vietnamese standards should be followed to carry out the inundation analysis.

Process for survey of motorway	22TCN 263-2000
Specification for topographical measurement	96TCN 43-90
Rules on monitoring river flows to the areas affected by tide	94TCN 17-99

Rules on monitoring water levels and river water temperature	94TCN 1-2003
Rules on monitoring the flow of big rivers, medium rivers of the region has no effect on tidal	94TCN 3-90
Standard for calculation of flood runoff	22TCN 220-95
Standard for designing culvert	22TCN 18-79
Highway design requirements	TCVN 4054-1998
Standard for designing highway	22TCN 273-2001
Handbook of hydrological and hydraulic analysis of bridges and roads	BGTVT 2006

## 10. Terms of Reference (TOR) for Consulting Service

The Terms of Reference (TOR) for consulting service of inundation analysis covers the following works:

- (i) Collecting necessary hydro-meteorological and GIS data to develop inundation model
- (ii) Developing inundation model for Tra Bong, Tra Khuc and other rivers which lie in Quang Ngai section of Da Nang – Quang Ngai Expressway Development Project
- (iii) Determining the 1%, 4%, 5% and 50% exceeding probability water levels in rivers and on their floodplains along the expressway alignment with and without project scenarios
- (iv) Identifying the inundated sections of the expressway alignment with 1% and 5% flood considering without project scenario
- (v) Checking of openings (width and height) of drainage structures (bridges, viaducts, culverts, overpasses etc.) proposed in the expressway are sufficient or not for smooth flow of 1% flood water
- (vi) Proposing the optimal openings of drainage structures (bridges, viaducts, culverts, overpasses etc.) for smooth flow of 1% exceeding probability flood through the proposed drainage structures in the expressway
- (vii) Preparing the depth and duration flood maps of rivers and their floodplains for flood damage assessment with 1% and 5% floods with and without project scenarios
- (viii) Provide trainings to stakeholders on operation of the inundation model
- (ix) Modify the inundation model, results and report as per the comments of appraisal consultant and clients until the model output is not accepted.

## 11. Methodology of the Work

Supplemental to the above standards, inundation analysis shall be carried out in

accordance with the following procedures and methodologies.

### 11.1 Data Collection

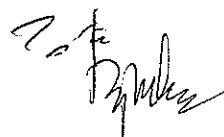
- (i) Hydrological and meteorological data necessary for inundation model development should be collected from Hydro Meteorological Centers.
- (ii) GIS and topographic data necessary for inundation model development should be collected from Natural Disasters Management and Mitigation Center, Quang Ngai and from other concerned offices.

### 11.2 Inundation Model Development

- (i) Develop inundation model coupling hydrological and hydraulic modeling systems and input the available surveyed river cross sections data in the model
- (ii) Use detailed grid sized DEM prepared from 1:10,000 scale or more detailed topo-data for floodplains and 1:25,000 scale or more detailed topo-data for catchment areas for inundation analysis
- (iii) Calibrate and validate the model with past rainfalls and river flows data
- (iv) Simulate 1%, 4%, 5% and 50% exceeding probability flood levels in rivers and on their floodplains with input of corresponding probability levels rainfalls in catchments with and without project scenarios
- (v) Verify the 1% flood level of rivers and floodplains simulated considering without project scenarios with observed 1% water level at stations in rivers and with interviewed high flood records of rivers and on floodplains in past
- (vi) Prepare depth and duration flood maps of rivers and their floodplains with 1% and 5% floods with and without project scenarios for flood damage assessment

### 11.3 Methodology for ensuring sufficient openings in drainage structures for smooth flow of 1% flood water through drainage structures

- (i) Simulate 1% flood water level ( $H_0$ ) from model with existing physical conditions and without project scenario
- (ii) Consult with hydrology, bridge and highway teams to get proposed dimensions of bridges, culverts, viaducts and overpasses along the expressway to incorporate in the model
- (iii) Simulate 1% flood water level with incorporating expressway alignment and drainage structures (bridges, culverts, viaducts, overpasses, etc.) in the model. Adjust openings of drainage structures of expressway in such a way that (i) flood water level at upstream ( $H_{US}$ ) of expressway will be same as flood water level of without project condition ( $H_0$ ) that is  $H_0 = H_{US}$ , and (ii) flood water level at upstream ( $H_{US}$ ) of expressway will be almost similar to



flood water level at downstream of expressway ( $H_{DS}$ ) that is  $H_{US} + H_{DS}$

#### 11.4 Start of inundation analysis

The inundation analysis should be started from 29<sup>th</sup> November 2011

#### 11.5 Completion of inundation analysis

The inundation analysis should be completed by 7<sup>th</sup> January 2012

#### 11.6 Reporting

- (i) Present 1% , 4%, 5% and 50% water levels in rivers and on their floodplains considering with and without project scenarios
- (ii) Present the identified inundated sections of expressway alignment considering without project scenario
- (iii) Present optimal sizes (openings) of drainage structures (bridges, culverts, viaducts, overpasses, etc.) in the expressway for smooth flow of 1% flood water from the drainage structures
- (iv) Prepare depth and duration flood maps of rivers and their floodplains with 1% and 5% floods considering with and without project scenarios for flood damage assessment
- (v) Prepare a comprehensive report with mentioning objective and rationale of the study, description of river systems, inundation analysis methodology and outcomes of the model

## 12 General Work Sequence of Inundation Analysis

General work sequence can be as follows:

- 1) The Sub-consultant should prepare and submit Work Plan for inundation analysis to the Consultant within the mentioned date
- 2) The Sub-consultant should work in close coordination with the Consultant and Natural Disasters Management and Mitigation Center, Quang Ngai
- 3) The Consultant provides information on expressway alignment, proposed stations and dimensions of bridges, culverts, viaducts and overpasses in the expressway.
- 4) The Consultant provides rainfall and water level data which are already collected and also provides surveyed river cross sections of major rivers at the quality acceptable to generate final products as required by Sub-consultant.
- 5) The Sub-consultant should develop inundation model in close coordination and consultations with topo-survey, hydrology, bridge and highway teams of the Consultant

- 6) The Sub-consultant should provide the digital files of data, model outcomes and report to the Consultant
- 7) The Sub-consultant should provide training to the technicians or engineers of Natural Disasters Management and Mitigation Center, Quang Ngai on the operation of the inundation model

### **13. Time Schedule of the Work**

The Works shall be commenced immediately after signing of the Contract or the issuance of the Notice to Proceed by the Consultant. All the Work shall be completed not later than 7<sup>th</sup> January 2012. The Sub-consultant shall submit the detailed plan and schedule to the Consultant.

### **14. Supervision of the Work**

The Consultant has the right to supervise all of the works and to approve the plan of operation, work methods and progress of the Work. The Consultant also has the right to accept and reject the results of the Work.

### **15. Other Requirements**

The Sub-consultant shall arrange at his own expenses so that he may have free access to the land required for performing the Works, whether it may be under the ownership of the Government or the third parties. The Sub-consultant shall indemnify any damages to the land and associated properties.

### **16. Final Products**

The Sub-consultant shall submit the final products listed below in principle.

The Sub-consultant shall confirm with the Consultant for the format and quantities of the final products sufficiently advance to the submission.

After confirmation of the format and quantities of the final products, the Sub-consultant shall submit draft version(s) for approval of the Consultant.

The Consultant shall check the format and quality, and make necessary instruction timely in order to achieve acceptable quality of the products.

- |                               |                                    |
|-------------------------------|------------------------------------|
| 1) Hydro-meteorological Data  | 15 sets of hard copy and soft data |
| 2) Inundation Analysis Model  | 15 sets soft data                  |
| 3) Inundation Analysis Report | 15 sets of hard copy and soft data |

Hydro-meteorological data should be provided in Excel format. However, identified inundated sections of expressway alignment; and flood maps of project area should be

presented in color printing in A3 size paper. All the drawings shall be produced using the drawing frame approved by the Consultant. Each drawing should be labeled with the date of generation, unique drawing number, version number and alignment section.

In order to make report of a reasonable size, the Sub-consultant may split the information into manageable parts with the approval of the Consultant.

Inundation analysis report shall describe the objectives and rationale of the study, methodology adopted for analysis, equipment and software used, work schedule, difficulties encountered and its solutions, final results of the analysis, etc.

Sub-consultant shall submit Proof Copies before finalizing reports. Proof Copies of reports shall consist of two (2) hard copies. The Consultant will return one (1) copy within two (2) weeks of receipt with any corrections to be made annotated on the copies.

The approved final reports shall be retained by the Sub-consultant for a period of two (2) years from the issue of the corresponding inundation analysis report, during which time they shall be made available to the Consultant on request and copies supplied to the Consultant when instructed.

### Bill of Quantities (BOQ)

S.N.	Item	Unit	Unit Price (USD)	Quantity	Total Amount (USD)
1	Data review and conversion to GIS database	LS	3,000	1	3,000
2	Hydrologic and hydro-dynamic models modifications and calibrations	LS	9,000	1	9,000
3	Inundation analysis regarding to natural and design cases	LS	4,000	1	4,000
4	Training to stakeholders on model operation	LS	1,000	1	1,000
5	Software	LS	5,750	1	5,750
	<b>Sub-Total</b>				<b>22,750</b>
	VAT (10%)				2,275
	<b>Total</b>				<b>25,025</b>

*2014*

*Spikes*