DEPARTMENT OF PUBLIC WORKS & HIGHWAYS

TERMS OF REFERENCE (TOR)

CONSULTANCY SERVICES

For and in the Conduct of

GEOTECHNICAL ASSESSMENT AND SEISMIC HAZARD ANALYSIS FOR THE CONSTRUCTION OF BRIDGE CONNECTING SANTIAGO ISLAND TO BOLINAO, BOLINAO, PANGASINAN

I. INTRODUCTION

A. BACKGROUND

The Government of the Philippines (GOP), through the Department of Public Works and Highways, intends to engage the services of a qualified and experiences Consulting Engineering Firm to provide the necessary engineering services that involve soil investigation and soil exploration.

B. OBJECTIVE

To obtain all relevant geotechnical considerations for the proposed structure, as well as the seismotectonic environment, seismicity, earthquake catalog processing, applicable attenuation models and the development of ground motions necessary for carrying out dynamic analysis in accordance with structural bridge design guidelines.

C. PROJECT DESCRIPTION

The proposed project is subject to Geotechnical Assessment and Seismic Hazard Analysis.

Name of project	Number of units	Number of boreholes	Depth (m)
Construction of Santiago-Bolinao Bridge	1	8	45

D. GENERAL

1. The Consultant shall be responsible for carrying out the necessary subsurface soil exploration works in respect to the project stated.

2. The Consultant shall coordinate with the Planning & Design Division during the conduct of geological and geotechnical surveys and investigations along the proposed project specifically with bearing capacity and settlement requirements, scouring, liquefaction potential, and seismicity of the project site.

3. The Consultant shall provide all labor, instruments, materials, supplies, vehicles, etc. necessary to perform satisfactorily the investigation works. All expenses to be incurred are chargeable against funds allocated for preliminary/detailed engineering design.

4. The Consultant shall coordinate with the DPWH Regional Office concerned during conduct of geological and geotechnical investigations at proposed projects site. The Consultant should be able to identify areas with geological problems and difficulties, and shall conduct the following:

- Collection of available Geological information such as relevant geological study, reports, documents and maps for the project area.

- Geological mapping of fault lines specifically active ones that could affect the stability of proposed project.

- Determine if the proposed project site is prone to settlement, scouring, liquefaction potential, slope movements of and other foundation instabilities.

5. The Consultant shall be responsible for the reliability of the report presented.

E. SCOPE OF WORK

1. Geotechnical Assessment

   A geotechnical assessment shall be performed for all the boreholes. Soil parameters needed for the various geotechnical models shall be determined. These include shear strength parameters and bearing capacities (shallow and deep foundation). Emphasis shall be directed towards the assessment of the following geotechnical concerns:

   a. Foundation Analysis – computation of the bearing capacity and settlements and include analysis for both shallow and deep foundation; pile capacity calculations shall also be carried out.

   b. Liquefaction Analysis – liquefaction analysis of the SPT data logging during field boring works shall be undertaken.

   c. Slope Stability Analysis –Analysis of the stability of the cuts or embankments (fill), along with related reinforcements and/or retaining structures, at the bridge abutments shall be performed.

2. Seismic Hazard Analysis (SHA) – Seismic Hazard Analysis shall be performed using probabilistic seismic hazard analysis (PSHA) and deterministic seismic hazard analysis (DSHA).

3. Shear Wave Velocity Test

   Shear Wave Velocity Test using PS Logging. Conduct borehole drilling/ non sampling on two (2) locations down to 60 meters deep.

II. IMPLEMENTATION

A. REPORTS AND DELIVERABLES

1. Geotechnical Assessment Final Report

    a) Subsurface Conditions

    b) Geotechnical Parameters

    c) Liquefaction Analysis

    d) Geohazards

    e) Deep Foundation

    f) Recommendation for Pile Testing

2. Seismic Hazard Analysis Final Report

    a) Geologic Considerations

    b) Site Characterization

    c) Historical Earthquakes and Potential Earthquake Generators

    d) Pre-processing of Seismicity Data

    e) Performance-Based Seismic Design Framework

    f) Ground Motion Prediction Equations

    g) Deterministic Seismic Hazard Analysis

    h) Probabilistic Seismic Hazard Analysis

    i) Disaggregation of Seismic Hazard

    j) Uniform Hazard Response Spectra

3. Shear Wave Velocity Test Results with Analysis/ Result Interpretation

    - Literature research and compilation of data, methodology, project description, operator, weather conditions, type and description of recording instrument, seismic source and receiver, elevations, time of arrival, and its corresponding dynamic (soil/rock) properties.

All outputs shall be presented in English language and shall be submitted to DPWH in three (3) copies. Electronic file formats (i.e. Microsoft Office, Adoobe PDF, AutoCAD,

transport model input and output files, etc.) of all reports and documents systematically organized in traceable and auditable formats shall be prepared in DVD and/or CD, 3 copies each.

All Draft Final Outputs shall be submitted at least two weeks prior to the contract expiration and be subjected to review and evaluation of the Implementing Office, PDD and other relevant offices as deemed necessary. The reviewing office shall review the draft reports for a maximum of two weeks, therefore, final reports are expected to be delivered not later than the contract expiration.

B. KEY EXPERTS' QUALIFICATION AND REQUIREMENTS

The following experts/professionals and their member shall be required to carry out the Consulting Services for the project and should have appropriate educational degree, relevant training and adequate years of experience in the conduct of subsurface soil exploration.

Position/Key Staff	No. of Staff	Detailed Tasks/ Responsibilities	Required Qualifications
Sr. Geotechnical Engineer	1	Responsible for conducting geotechnical investigations, gathering information and reporting results of investigations and evaluations of section/areas of engineering concerns.	BSCE (licensed) with at least 10 years of specialization / experience in Geotechnical Engineering investigations of infrastructure projects.
Geologist	1	Conduct site engineering geological, structural geological, geohazard assessment and geotechnical tests of the proposed project area or land development area; Prepares Engineering Geological and Geohazard Assessment Report.	BS Geology (licensed) with at least 10 years of specialization / experience in Engineering Geology

C. WORK SCHEDULE

The Consultant's contract period for undertaking the Geotechnical Assessment and Seismic Hazard Analysis shall be Sixty (60) Calendar Days and the Consultant shall commence work after receipt of Notice to Proceed.

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