



TERMS OF REFERENCE

FOR

CONDUCT OF SUBSURFACE EXPLORATION/PRELIMINARY DETAILED ENGINEERING FOR THE ORGANIZATIONAL OUTCOME 2: PROTECT LIVES AND PROPERTIES AGAINST MAJOR FLOODS: FLOOD MANAGEMENT PROGRAM: CONSTRUCTION/MAINTENANCE OF FLOOD MITIGATION STRUCTURES AND DRAINAGE SYSTEMS:

- 1) CONSTRUCTION/REHABILITATION OF SHORELINE PROTECTION/SEAWALL STRUCTURE, BARANGAY CALO, SAN JOSE, NEGROS ORIENTAL
- 2) CONSTRUCTION/REHABILITATION OF SHORELINE PROTECTION/SEAWALL STRUCTURE, BARANGAY AJONG, SIBULAN, NEGROS ORIENTAL
- 3) CONSTRUCTION/REHABILITATION OF FLOOD CONTROL STRUCTURE ALONG TANJAY RIVER, NEGROS ORIENTAL
- 4) CONSTRUCTION/REHABILITATION OF FLOOD CONTROL STRUCTURE ALONG TAMOGONG RIVER, BAIS CITY, NEGROS ORIENTAL

I. INTRODUCTION

A. BACKGROUND

The Government of Republic of the Philippines through the Department of Public Works and Highways, Negros Oriental 2nd District Engineering Office intends to engage the services of Local Consultancy firms for the conduct of Geotechnical Investigation Report for the following:

- 1) CONSTRUCTION/REHABILITATION OF SHORELINE PROTECTION/SEAWALL STRUCTURE, BARANGAY CALO, SAN JOSE, NEGROS ORIENTAL
- 2) CONSTRUCTION/REHABILITATION OF SHORELINE PROTECTION/SEAWALL STRUCTURE, BARANGAY AJONG, SIBULAN, NEGROS ORIENTAL
- 3) CONSTRUCTION/REHABILITATION OF FLOOD CONTROL STRUCTURE ALONG TANJAY RIVER, NEGROS ORIENTAL
- 4) CONSTRUCTION/REHABILITATION OF FLOOD CONTROL STRUCTURE ALONG TAMOGONG RIVER, BAIS CITY, NEGROS ORIENTAL

B. OBJECTIVE

By the end of the contract period, the Consultant is expected to produce a Geotechnical Report to be used in the preparation of Detailed Engineering Plans. Specifically, it aims to achieve the following undertakings:

1. Determine the soil profile at the project site as basis for the design;
2. Identify possible geological and geotechnical hazards and recommend structural and non- structural measures to reduce the effects of these hazards;



3. Impart knowledge to selected observers from the department the process and analysis of geotechnical investigations.

C. PROJECT SCOPE

Hereunder are the proposed flood control and bridge project wherein soil subsurface exploration test shall be undertaken.

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II. SCOPE OF CONSULTING SERVICES

A. GENERAL

- a. The Consultant shall be responsible for carrying out the necessary soil investigation in respect of the projects cited above.
- b. The Consultant shall coordinate with the DPWH Negros Oriental 2nd District Engineering Office, Planning and Design Section, Cangmating, Sibulan, Negros Oriental particularly on the site of the project, and with the Quality Assurance Section particularly on laboratory testing for confirmatory tests.
- c. During the conduct of geotechnical investigation, the Consultant shall request the presence of a DPWH, Negros Oriental 2nd District Engineering Office personnel (Planning and Design Section and Quality Assurance Section), particularly on soil sub surface exploration requirements stipulated in the 2015 DPWH Design Guidelines, Criteria and Standards, Volume 5, Bridge Design, 2015 DPWH Design Guidelines, Criteria and Standards, Volume 2C, Geotechnical and Geological Investigations and applicable provisions of existing laws, codes or relevant Department Orders, Memoranda, etc. to minimize changes/modifications and unnecessary delays in the preparation of geotechnical reports.
- d. Delineate and identify geological structure, especially active faults and potential mass movement areas that might traverse the project area, including analysis for liquefaction potential during earthquake and consolidation due to soft ground.
- e. Upon completion of the subsurface exploration work activities, the Consultant shall submit their geotechnical report in *E - file copy* and five (5) *hard copies* to the Planning and Design Section, DPWH NO2-DEO.



- f. The consultant shall be responsible for the reliability of the report presented.

B. THE SERVICES

1. Geotechnical Investigations

Detailed geotechnical and geological survey shall be carried out along the proposed project centers as well as on the proposed widening.

- a. For River Control Projects: A minimum of one (1) borehole per *150-meter* interval along the project length or any change in riverbed characteristics. Boring shall be carried out to a depth of *30m* in ordinary soil, or to 3m into sound rock if rock is encountered above the depth.
- b. The following tests shall be conducted on borehole samples: Standard Penetration Test (SPT) at maximum interval of 1.5 m and at every change in soil stratum, and Laboratory Test such as obtainment of Moisture Content and Specific Gravity, Grain-size Analysis (Mechanical Sieve Analysis and Hydrometer Analysis), Atterberg Limits, Unified Soil Classification System (USCS), Unconfined Compression Test (for soils), Unconfined Compression Test (for Intact Rock), Tri-axial Test (Unconsolidated-Undrained), Tri-axial Test (Consolidated-Undrained), Oedometer Test (1-D Consolidation), Direct Shear Test, Soil Sulfate Test and Constant-Head Test Falling-Head Test.

In addition, the following soil parameters shall be completely indicated **per layer**:

- Specific gravity
- Natural moisture content
- Dry, moist, and saturated unit weights
- Angle of internal friction
- Cohesion

Lastly, the Medium Diameter of River Bed Material (D_{50}) shall also be determined.

- c. The review and approval of the geotechnical surveys and investigations reports/plans which shall be undertaken by the DPWH, Negros Oriental 2nd District Engineering Office do not relieve the Consultant(s) from responsibility of determining the sufficiency and appropriateness of the geotechnical investigation works including the laboratory tests and evaluation of results.

2. Preparation and Submission of Reports



The following reports shall be presented in legible manner, all in English language, compiled and submitted to Department of Public Works and Highways – Negros Oriental 2nd District Engineering Office:

a. Geotechnical Investigation Report

After conducting the above tests, the following information shall be required in the summary of geotechnical investigation report:

- Executive Summary
- Objectives and Scope of Work
- Vicinity Maps in scale of 1:50,000
- Geology and Seismicity
- Field Investigation and Methodology
- Field and Laboratory Test Results
- Borehole Drilling and Sampling
- Final Boring Logs (BL)
- Final Laboratory Test Results (FLTR)
- Borehole Location Plan in scale of 1:250 with coordinates and elevations
- Soil Stratigraphy at bridge site
- Soil Profile along structures showing boring/drilling logs
- Geological and Geotechnical Parameters based on test results
- Soil parameters such as unit weight, cohesion/adhesion, modulus of subgrade reaction, negative skin friction
- Allowable bearing capacity
- RQD
- Evaluation and Findings, Conclusion
- Recommendations if called for, such as type of proposed countermeasures/ structures to address geological/geotechnical problems and foundation type.

b. Other data to be submitted

i. Geotagged Photographs

Geotagged photographs with coordinates showing the borehole drilling and sampling at each proposed sites shall be taken by the Consultant and form part of the report. The photographs to be taken at each borehole location depicting the following:

- Equipment used
- Core drilling operation
- Water level measurements
- Performance of SPT sampling
- All cores and SPT sample placed in core boxes
- Date photographs were taken
- Location of station



- ii. Location Map
 - iii. Boring Logs
 - Job, boring, hole number, date, time, boring/drilling foreman and supervisor
 - Weather condition
 - Median Grain Size D50
 - Depth of water level
 - Method of penetration and flushing system
 - Description of soil strata encountered
 - Depth of soil boundaries
 - Size, type and depth of samples and sample number
 - Type and depth of in situ test
 - Standard Penetration Tests Resistance, "N" values
 - Detailed notes on boring/drilling procedure, casing sizes and resistance to driving, description of washwater or spoil from boring/drilling tools
 - Depth of boring
 - Other relevant information such as RQD, percent core recovery, etc.
 - iv. Liquefaction Susceptibility Map
 - v. Seismic Hazard Map
 - vi. Final Borehole Log (ASTM and DPWH Standard)
- c. Sample Outline of Geotechnical Report as per DPWH DGCS Vol. 2C

GEOTECHNICAL REPORT OUTLINE

- I. Introduction
 - A. Project Background
 - B. Project Location and Site Description
- II. Objectives and Scope of Work
- III. Geology and Seismicity
 - A. Regional Geology
 - B. Site Geology
 - C. Seismicity
- IV. Field and Laboratory Tests
 - A. In-situ Tests (w/ description of test conducted)
 - B. Laboratory Tests (w/ description of test conducted)
- V. Results of Field Investigation and Laboratory Testing
 - A. Subsurface Soil Condition
 - B. Geotechnical Parameters based on Test Results
- VI. Evaluation and Findings
- VII. Conclusions and Recommendations



VIII. Reference

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Appendix

- Location Map
- Geologic Map
- Borehole Location Plan
- Geologic Cross-Sections & Soil Profiles
- Borehole Logs
- Geophysical Data (if conducted)
- In Situ Test Data
- Laboratory Test Data
- Detailed Calculations
- Additional Photographs

The sub-surface soil exploration works including laboratory tests shall be completed within time frame upon receipt of the Notice to Proceed.

III. IMPLEMENTATION

A. STAFFING

The Consultant shall provide the following key staff and job description as prescribed below:

Position	Job Description	Required Qualifications	No. of Personnel	Required Qualifications
Geotechnical Engineer	Responsible for conducting geotechnical investigations, gathering information and reporting results of investigations and evaluations of section/areas of engineering concern	BSCE (licensed) with at least 5 years of specialization/experience in Geotechnical Engineering investigations of infrastructure projects	1.0	1.0



Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
NEGROS ORIENTAL 2ND DISTRICT ENGINEERING OFFICE
Sibulan, Negros Oriental



BAGONG PILIPINAS

Geologist	Analyze/ Study Natural Phenomena occurring on and beneath the surface and integrate these in the selection of alignment as well as in the design	BS Geology (licensed) with at least 5 years of specialization/experience in Engineering Geology	1.0	1.0
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B. CONTRACT PERIOD

The Consultant's contract period for undertaking the geotechnical investigation work shall be **Thirty (30) calendar days** and the Consultant shall commence work upon receipt of Notice to Proceed.

C. LIABILITIES OF THE CONSULTANT

Review made by the DPWH NO2-DEO shall not release the Consultant from responsibility, except when substantial changes have been made without conformity of the Consultant.

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