



## **TERMS OF REFERENCE**

### **CONSULTING SERVICES FOR THE CONDUCT OF SOIL TESTING/EXPLORATION OF PROJECTS UNDER GAA FY 2025**

#### **Flood Control**

- Construction of Flood Control and Drainage Structure (FCDS) along Santa Cruz River, Section 1, Barangay Barat, Bambang, Nueva Vizcaya
- Construction of Flood Control along Angadanan River, Package 2, Barangay Darubba, Quezon, Nueva Vizcaya
- Construction of Flood Control and Drainage Structure (FCDS) along Lamut River, Package 7, Bakir Section, Bagabag, Nueva Vizcaya
- Construction of Flood Control and Drainage Structure (FCDS) along Sta. Fe River, Phase 1, Indiana - Almaguer North, Bambang, Nueva Vizcaya
- Construction of Baretbet - Sta. Lucia (Sitio Dissu) Flood Control Structure Along Magat River, Phase 1, Bagabag, Nueva Vizcaya

#### **Road Slip**

- Bambang-Kasibu-Solano Rd. - K0326 + 850 - K0326 + 950
- Papaya-Malabing-Wangal Binugawan-Tadji-Runruno Rd - K0314 + 900 - K0315 + 000

#### **Building**

- Construction of Multi-Purpose Building DepEd Bayombong, Division Office, Bayombong, Nueva Vizcaya
- Construction of Multi-Purpose Building Brgy. Bakir, Bagabag, Nueva Vizcaya
- Construction of Multi-Purpose Building Brgy. Tiblac, Ambaguio, Nueva Vizcaya
- Construction of Multi-Purpose Building Brgy. Poblacion, Diadi, Nueva Vizcaya
- Construction of Multi-Purpose Building Brgy. Napo, Ambaguio, Nueva Vizcaya
- Construction of Multi-Purpose Building Brgy. San Luis, Solano, Nueva Vizcaya
- Construction of Multi-Purpose Building Brgy. Luyang, Bayombong, Nueva Vizcaya
- Construction of Multi-Purpose Building Brgy. Bansing, Bayombong, Nueva Vizcaya
- Construction of Multi-Purpose Building Nueva Vizcaya State University (NVSU) Alumni Building Bayombong Campus, Bayombong, Nueva Vizcaya
- Construction of Multi-Purpose Building Brgy. Calaocan, Quezon, Nueva Vizcaya
- Construction of Multi-Purpose Building Brgy. La Torre North, Bayombong, Nueva Vizcaya
- Construction (Completion) of the Legislative Building in the Municipality of Diadi, Province of Nueva Vizcaya

## **I. INTRODUCTION**

Geotechnical Engineering is the process of understanding and working with soil and rock, underground water, site and structural conditions, in relation to a construction project.

The proposed conduct of geotechnical investigation (soil analysis) is the basic data input/requirements in the detailed engineering design of structures project in order that safe and economical foundation of buildings works may be designed.

## **II. OBJECTIVES**

1. To obtain information relative to the distribution and properties of soils, groundwater and surfaces drainage conditions and other pertinent data necessary for a rational and economic design of any structure's projects.
2. To Determine the arrangement of the soil strata or soil profile and engineering properties of the underlying soils, establish its compressibility strength and other characteristics, as well as the soil bearing capacities.
3. The results of geological and geotechnical investigations which is among the basic data input/requirements in the detailed engineering design of structures projects in order that safe and economical foundation and slope protection works may be designed. –

## **III. PROJECT SCOPE**

The proposed projects are subject for the detailed engineering design and the results of geological and geotechnical investigation is the basic data input/requirements for the safe and economical foundation of buildings of the projects.

## **IV. SCOPE OF CONSULTING SERVICES**

The consultant shall coordinate with the Planning and Design Section during the conduct of geotechnical and geological surveys and investigations along the entire project areas, specifically at locations with observed slope failures, tension cracks, landslide scars, and areas with settlement and subsidence and at sinking areas.

The Consultant shall identify areas with geological problems and difficulties, and water bearing stratum causing subsurface discharge, which could affect the stability of the project.

In general, the Consultant shall conduct the following:

1. **Geological Survey and Investigation, consisting of, but not limited to the following:**
  - a. Collection of geological information such as aerial photographs, satellite imagery, relevant geological study reports/document (delineate source areas, slope materials, run out areas, climatic dependency, vegetation type and size, soils/ rock type property, geologic structure, seismicity and geohazards), water condition (surface and subsurface) and location maps for the project areas with geographical/grid coordinate system.

- b. Collection of geological information for Road slip such location and size of fallen rocks, location of structure at risk, sources of rock characteristic (Rock type, strength, jointing, block size), slope material characterization, sliding surface (possible shallow rotational/translational slides).
- c. Geological mapping of the existing ground formation along the project alignment specifically at slope disaster areas by conduction site ocular inspection.
- d. Geological survey for improvement/rehabilitation of project necessary for detailed engineering.
- e. Identification of materials source areas for borrow, aggregate and other materials necessary for the construction of projects.

**2. Geotechnical investigation, consisting of, but not limited to the following:**

- a. At proposed projects sites, deep drilling with Standard Penetration Tests (SPT) and rock coring shall as follows:

Structure	Depth
Riverbed Structure	depth of Twenty (20) meters or until three (3) consecutive SPT N-Value > 40 is obtained whichever is great
Active Slope Protection Structures	depth of Thirty (30) meters Where stratification indicates a possible deep stability or settlement problem, boring shall extend until three consecutive SPT N Value > 40 are obtained
Building	Minimum depth of borehole shall be thirty (30) meters or five (5) meters into bearing layer, whichever comes first.

- b. Standard Penetration Test (SPT) shall be made at a minimum interval of 1.50m and at every change of soil layer. Boring will be terminated when 3.00m of penetration into a stable strata/hard rock is encountered at shallower depth or as determined by the Engineer In-Charge. If necessary, upon instruction of the Engineer In-Charge, drilling may extend beyond 30.00m.
- b. Detailed soil investigations shall be undertaken along the project areas with the purpose of identifying types of borrow soils. This should not be confined to floor plan area only, but include side cut sections affected for future expansion.
- c. All pits and boreholes shall be properly logged and drawn in A1 size plans showing the thickness of each layer, the color, the type and visual description of each layer, depth below the surface, depth of water level (if encountered), etc. The following laboratory tests and analyses shall be made on the samples taken:

- 1. Minimum laboratory Test Requirements:**
  - a. Mechanical Sieve Analysis

- b. Specific Gravity
  - c. Atterberg Limits
  - d. Natural Moisture Content
  - e. California bearing ratio (CBR)
  - f. Soil/Rock Strength Test
  - g. Direct Shear Test (DST) or Triaxial Compression Test
  - h. Unconfined Compression Test (UCT)
- 2. Conditional Test Requirements based on Actual Site Condition
  - a. Consolidation Test
  - b. Permeability Test
  - c. Hydrometer Test
- d. Sources of construction materials shall be investigated and identified to determine the adequacy of suitable materials. Samples from identified sources shall be subjected to laboratory testing.
- e. At each proposed construction materials source, two (2) test pits shall be made and sufficient samples shall be taken for laboratory testing.

## **V. IMPLEMENTATION**

### **A. OUTPUTS/DELIVERABLES**

#### **1. Inception Report**

The Consultant is required to submit within one month after commencement of services. It shall outline a detailed work program and briefly describe the methodology and project schedule (GANTT and S-Curve) proposed to meet the terms of reference. The report shall include the initial findings as well as preliminary layout of the forms to be used for various investigations and calculations. Inception Reports shall be submitted in soft-bound copy with title of the report written at the spine.

#### **2. Monthly Progress Report (MPR)**

During the period of contract, the Consultant shall prepare a monthly progress report to be certified by the designated Civil Engineer Preferably Materials Engineer/Geotechnical Engineer of the Consultant and submit them to the DPWH-NV1stDEO every after One (1) borehole has been completed. The MPR shall consist and/or discuss, but shall not be limited to the following:

- a. Overall summary of accomplishment
- b. Drilling/Boring and Test Pitting progress
- c. Laboratory tests accomplishment
- d. Schedule of work
- e. List of equipment used
- f. Organizational Chart
- g. Detailed progress chart

#### **3. Partial Reports on Investigation Results**

The Consultant is required to submit partial reports consisting of completed results of boring in the form of a final boring log and soil profile for immediate use in the preliminary design works.

#### **4. Final Reports**

Upon completion of the geotechnical services, the Consultant shall prepare and submit a final report to the DPWH-NV1stDEO. The final report shall consist in 3 bound copies duly signed and sealed by the Geotechnical Engineer of the consultant. All test reports shall also be duly signed by a Civil Engineer/Material Engineer. The final report shall include but not limited to, the following:

- a. Field Geological/Geotechnical investigation and methodology
- b. Borehole drilling/coring
- c. Laboratory testing
- d. Vicinity Maps in scale of 1:50000
- e. Final Boring Logs (BL)
- f. Final Laboratory Tests Results (FLTR)
- g. Borehole Location Plan in scale of 1:250
- h. Soil Profile along structures showing boring/drilling/coring methods
- i. Evaluation and recommendation that includes the complete recommended geotechnical parameters relevant to design and construction of multi-purpose building works: i.e., total and effective shearing strength parameters, index properties, computed allowable soil bearing capacity with respect to depth, etc.
- j. Recommendation if called such as type of proposed countermeasure/structure to address geotechnical problems and foundation instability of the building/structure.
- k. Rock Mass Rating

#### **5. Other Data to be Submitted**

- a. Boring Logs
  - Job, borehole number, date, time, boring/drilling foreman and supervisor
  - Weather conditions
  - 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 Test Resistant, "N" values
  - Detailed notes on boring/drilling procedure, casing sizes and resistance to driving, description of wash water or spoil from boring/drilling tools
  - Depth of boring, borehole location (Station, Easting, Northing and Elevation)
  - sample recovery and RDQ for rock strata
  - Classification of Soil/Rock
  - Coordinates of bore holes
  - Artesian Pressure Information (Dam and Waterworks Project)

- b. Photographs  
Photographs showing the borehole drilling and sampling at each proposed site shall be taken by the Consultant and form part of the report. The photographs to be taken shall depict the following:
- Equipment used
  - Core drilling operation
  - Water level measurements
  - Performance of SPT sampling
  - All core and SPT samples placed in core boxes with depth markings
  - Date photographs were taken
- c. The sub-surface soil exploration works including laboratory tests shall be completed within time upon receipt of the Notice to Proceed.

## B. DURATION OF CONSULTANCY SERVICES

The Consultant's contract period for undertaking the soil exploration shall not be more than Eighty-Five (85) calendar days and the Consultant shall commence upon receipt of Notice to Proceed (NTP).

## C. SCHEDULES

The data gathering shall be carried out for a period of Eighty-Five (85) calendar days.

ACTIVITIES	Week														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Drilling															
Laboratory															
Reports															

The Consultants shall be composed of qualified staff with experience in the conduct of geological and geotechnical investigation (soil analysis) for buildings and slope protection structures.

KEY STAFF	Week														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Project Manager															
2. Geotechnical Engineer															
3. Civil Engineer / Materials Engineer															
4. Laboratory Technician															

## VI. MANPOWER REQUIREMENTS

The Consultant shall be composed of qualified staff with experience in the conduct of geological and technical investigation.

<b>Position</b>	<b>Job Description</b>	<b>No. of Staff</b>	<b>Required Qualifications</b>
<b>Project Manager</b>	Prepares operation plan, create a schedule and timeline, execute each phase of activity. Supervises all aspects of the project to ensure compliance with the objectives and maintain progress in accordance with the contract time schedule.	1	Registered/Licensed Civil Engineer, or equivalent, with extensive experience in geotechnical investigations and related areas as stipulated in the DPWH Design Guidelines, Criteria and Standards. Minimum of 10 years of experience in the related field.
<b>Geotechnical Engineer</b>	Work includes assessing data from the field, evaluating the characteristics of the ground upon which a structure is built , and overseeing work on a construction site Provide geotechnical related analysis and reports	1	Registered/Licensed Geotechnical Engineer, or equivalent, with extensive experience in geotechnical investigations and related areas as stipulated in the DPWH Design Guidelines, Criteria and Standards. Minimum of 5 years of experience in the related field.
<b>Civil Engineer / Materials Engineer</b>	<ul style="list-style-type: none"> <li>Oversee the progress of works</li> <li>Supervision of field staff and the methods of works</li> </ul> Assists the Geotechnical Engineer in the collection of necessary data and information, in carrying out detailed soil investigations along the road alignment	2	Registered/Licensed Civil Engineer and Accredited Materials Engineer, or equivalent, with specialization in material engineering. He/she must be equipped with dedicated software. Minimum of 3 years of experience in the related field.
<b>Laboratory Technician</b>	Conduct Laboratory testing and analyzing soil samples to describe and understand different characteristics of the soil	2	Graduate of BS Civil Engineering or Accredited CSC MC 11. He/she must be equipped with dedicated software. Minimum of 3 years of experience in the related field.

#### **A. ASSISTANCE TO BE PROVIDED BY DPWH**

- a. In connection with the tasks of the Consultant that require inputs and assistance from other government agencies as well as Local NGO's members of the Congress and officials of the Region/Provincial branches of National Government Agencies, the DPWH shall ensure that the Consultant has access to all relevant information necessary to the performance of the above services. The Consultant is expected to provide office space and equipment and all other resources necessary for completing the services.

Prepared by:

Recommending Approval:

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