ENVIRONMENTAL IMPACT STATEMENT REPORT

PREPARED BY:
A-CUBED ENGINEERING SERVICES

Executive Summary

This Environmental Impact Statement (EIS) Report was prepared to secure the Environmental Compliance Certificate (ECC) of the proposed Brittannika Golf Course Project located at Brgy. Linan, Tupi, South Cotabato in compliance with Section 4 of Presidential Decree Number 1586 and its Implementing Rules and Regulations (IRR). Pursuant to EMB MC No. 2014-005, the proposed project is considered as Environmentally Critical Project (ECP). It stated therein that prior to operation of the project covered under Environmental Management Bureau (EMB) Memorandum Circular Number 2014-005, the same should secure an ECC. Hence, the proponent prepared this EIS for approval of EMB Central Office.

The planned Brittannika Golf Course Project is an 18-hole golf course located on a 22.3-hectare property covered by five (5) land titles - Transfer Certificate of Titles (TCT) Nos. 145-2016003696, 145-2016003697, and 145-2016003698, Original Certificate of Titles P-25653 and P-16912, and all of which are registered under and owned by Brittannika Golf Course, Inc.

ES. 1. Project Fact Sheet

Table ES-1: Basic Project Description

Project Name	Brittanika Golf Course Project
Project Type	Golf Course (18 holes)
Project Location	Barangay Linan, Tupi, South Cotabato
Project Area	22.3 covered by TCT Nos. 145-2016003696, 145-2016003697, and 145-2016003698
Proponent Name	Brittanika Golf Course Inc.
Proponent Address	Brgy. Linan, Tupi, Soiuth Cotabato
Proponent Representative (s)	John Paul Tamayo President CP No. (0999)990- 5045 Email Add:brittannikagolfcourse@gmail.com

Table ES-2; Project Components:

• Eighteen (18) holes (Golf range);
• One (1) unit Clube House1;
• One (1) unit Guardhouse
• One (1) unit Coffee shop
• One (1) unit Range lawn 1
• One (1) unit Kid's Playground
• Two (2) units Overhead tank
• Five (5) units Villa 1

• One (1) unit Staff house w/ motorpool 1
• One (1) unit Staff house w/ motorpool2
• Two (2) units Swimming pool 1
• Ten (10) units Villa 2
• Two (2) units Swimming pool 2
• One (1) unit Parking area
• One (1) unit MRF/Hazwaste Storage Fertilizer Storage Building
• One (1) unit Greenhouse
• One (1) unit Driving range2
• One (1) unit Spa/salon/barbershop
• One (1) unit Clubhouse2
• One (1) unit Range lawn 2
• One (1) unit Lagoon 1
• One (1) unit Lagoon 2
• One (1) unit Lagoon 3
• One (1) unit Lagoon 4
• One (1) unit Lagoon 5

ES. 2. Process Documentation

ES 2.1 EIA Team

Table ES-3; Environmental Impact Assessment (EIA) Team is composed of the following specialists:

Team Member	Field of Expertise	Registration No.
Dr. Silverio V. Magallon, Jr	Team Leader and Social Impact Assessment	IP-R12-2021-001
Mr. Neil Jamili	Air Quality and Noise Specialist and Freshwater Specialist	IP-R12-2021-002
Kier Mitchel E. Pitogo, MSc.	Terrestrial Flora and Fauna	

ES 2.2 EIA Study Schedule and Area

The EIA study began with the fieldwork on May 9, 2020. Field activities for terrestrial flora and fauna, land use mapping, ambient air and noise quality sampling, and collection of samples for water quality analysis were done during these dates. A series of interviews and focus group discussions with key project stakeholders from Brgy Linan and the Municipality of Tupi including concerned government offices were done early in November 2019 and repeated on February 9, 2021 to March 15, 2021 due to the Covid-

19 pandemic. Writing of individual reports was done from the second week of May 2021 to July 2021 while integration of the EIS was done from Mid of July 2021 - August 2021. The draft EIS was submitted to the proponent on August 2021.

ES 2.3 EIA Study Schedule

EIA Activity/Stage	Date
EIA Planning, Project and Stakeholder Profiling	May 09, 2020
Preliminary IEC and consultation with the officials of Tupi	November 2020 up to February 15, 2021 (IEC)
Public Scoping	April 23, 2021
Technical Scoping	May 06, 2021
EIS Report Preparation	May 06, 2021 to August 2021
Official acceptance of EIS by EMB	Tentative date: August 30, 2021
1st Review	Tentative date: September 3,
Public Hearing	15days publication at EMB
Final Review	5days after the conduct of PH

ES 2.4 EIA Study Area

The EIA study is limited to the location of the proposed Golf Course and its nearby communities. Baseline data for ambient air quality and noise was done in the north and south of the project site. Collection of samples for water quality analysis was done is the river located north of the project site and in two groundwater stations adjoining areas.

Characterization of the socio-economic environment was done for Brgy Linan, Tupi, South Cotabato. Mostly secondary data were used for this component except for the interviews, focus group discussions and perception survey conducted with key project stakeholders in the barangay and city levels.

ES 2.5 Risk and Uncertainties

It is inevitable to have risks and uncertainties in the conduct of the EIA Study. These include parameter uncertainty such as lack of survey effort, inappropriate survey technique, shifting baselines, system complexity, determining the value/importance/ sensitivity, or can be practical and epistemological limitations to how much we can know. There can also be model uncertainties which rely on the type of modelling used, whether conceptual or predictive models. Incorrect inputs and assumptions, modeller biases as well as systemic uncertainty. Risks include cumulative, synergistic, simultaneous and interactive impacts and natural disasters. This could lead to a situation in which: decisions resulting in unwanted environmental consequences are made on the basis of erroneous information; democratic influence on decisions may be impeded by a lack of information; and information valuable to the discussions may fail to be brought to light. One way of reducing these disadvantages is to improve prediction performance. To mitigate these risks and uncertainties to proceed with the conduct of the study, it is

apparent that a good EIA Methodology is established. More emphasis is given to communication of uncertainty and to transparency in EIA predictions, especially in the EIS and decision documents. Although EIA predictions continue to be uncertain, the proponent, the decision-makers and other stakeholders are aware of this, and know which predictions are uncertain, the ways in which they are uncertain, the possible magnitude of the uncertainty, and the consequences the uncertainties may conceal through public participation and following the guiding principles of DAO 2017-15. Good descriptions of input data, methods, theories and assumptions are being considered in every step of the EIA process to ensure a better basis for informed decision-making and for handling the risk of unwanted environmental consequences by combined monitoring and mitigation measures during project implementation.

ES 2.6 EIA Methodology

The following discussion provides a summary of the methods used for the characterization of key environmental parameters in this EIS.

Pursuant to the Department Administrative Order (DAO) No. 30 Series of 2003 of the Revised Procedural Manual of the Philippine EIS System (PEISS) and EMB Memorandum Circular 2014-005 dated July 7, 2014, the proposed project is classified under Category A - Environmentally Critical Projects (ECPs) which requires an EIS Report for an Environmental Compliance Certificate (ECC) application.

The EIA for the proposed project conforms to the Revised Procedural Manual for DENR Administrative Order (DAO) 2003-30 and DAO 2017-15 in the conduct of the following activities, to wit: (i) IEC and Scoping, (ii) collection of primary and secondary data, (iii) identification/prediction/ assessment of environmental impacts, (iv) formulation of EMP, and (v) development of EMoP. The baseline information are mainly primary and secondary data which were obtained from the Local Government Units (LGUs) and other government agencies. The data collected were based from the EIA Scoping and Screening Form which was finalized during the Technical Scoping on May 06, 2021.

ES 2.6.1 Land use and classification – description of land uses within the project site and vicinity was based on existing information such as the Comprehensive Land Use and Zoning Plan and the Geographic Profile of the municipality.

ES 2.6.2 Geology and geomorphology – discussions were based on existing information such as the Geology of the Philippines and other geologic reports on Tupi, South Cotqbato

ES 2.6.3 Pedology – description was based on the Physical Profile of Tupi as well as the report on Soil Survey and Classification of South Cotabato published by the Bureau of Soils and Water Management. Soil samples were also obtained within the plant to serve as baseline data on soil quality.

ES 2.6.4 Terrestrial flora – reconnaissance survey and rapid resource assessment was done to estimate the present condition of plant species within the proposed plant site. Plants with >10cm diameter at breast height of were recorded individually while smaller plants were enumerated by stems. Plant species outside the sampling plots were also recorded.

ES 2.6.5 Terrestrial fauna – one observation point was established based on the nature and general spread of the proposed site. At least 30 minutes was spent to record observed species, group size, gender when possible and wildlife activity/behavior.

ES 2.6.6 Hydrology – description of hydrological characteristics was based on the Physical Profile of South Cotabato as well as on topographic maps and 2021 Google Earth satellite imageries of the project site.

ES 2.6.7 Water quality – water samples were collected from Creek and River. These were submitted to EMB laboratory for analysis of selected water quality parameters. Additional groundwater samples were also collected. Results were then compared to DENR –Water Quality Guidelines waters as well as the Philippine National Standards for Drinking Water (PNSDW).

ES 2.6.8 Meteorology and climate – meteorological and climatological conditions and projected data were obtained from PAGASA particularly on climatological norms and extremes.

ES 2.6.9 Air quality and noise – ambient air quality sampling and noise monitoring was done for 24 hours within the project site while one-hour sampling was conducted in the two stations located north and south of the project site.

ES 2.6.10 People – discussion on socio-economic conditions of the host barangay and the municipality of Tupi were obtained from the Provincial Planning and Development Office, Municipal Planning and Development Office and South Cotabato Profile, respectively. Primary data were collected during key informant interviews, focus group discussions and perception survey conducted at the barangay, municipal and provincial levels.

The study area focuses on the Direct and Indirect Impact Areas of the project delineated based on DENR Administrative Order No. 2017-15 and DAO 2018-18. Direct Impact Areas are: the 22.3-hectare golf course area in terms of physical environment where all project components are proposed to be located and Barangay Linan of which, in terms of social impacts, the primary beneficiary of the social development programs and projects whose demographic and socio-economic conditions would be affected by the project. Indirect Impact Areas are areas located outside the coverage of the project facilities and operations such as adjacent water bodies and surrounding barangays and adjacent barangays or municipalities that will benefit from potential revenues and taxes of the project are considered as indirect impact areas in terms of social impacts.

ES 2.7 Public Participation

ES 2.7.1 Perception Survey

The current socio-economic conditions of project-affected people (PAPs) and its perceptions towards the project. It also presents the impact management plan, and the social development and EIC frameworks for the proposed Brittannika Golf Course project.

In the conduct of this study, the team employed the following methodologies:

- **Desk review** - collection and analysis of secondary data, reports, relevant studies, and other pertinent data from reliable sources;
- **Information, Education, and Communication Campaign –** an IEC campaign was conducted last January 9, 2021 in the affected barangays of Tupi, South Cotabato. The EIC campaign was done through field visit, community consultations, and distribution of IEC materials;
- **Reconnaissance Survey -** preliminary perception survey was also implemented to have an initial information about views and opinions of project-affected people (PAPs); and
- **Socio-economic and Perception Survey.** A scientific investigation was conducted to characterize the socio-economic conditions of the affected households using computer-assisted personal interview (CAPI) technique. A total of 100 respondents were interviewed using *Kobocollect* and *Kobotoolbox* applications. A right-coverage rule was adopted in the selection of respondents to ensure proper distribution and well-representation of affected households. Figure 1 below depicts the spatial distribution of respondents.

The result of the conducted Perception Survey shows that majority of the stakeholders are favorable to the project and one of main concerns of the stakeholders is the hiring of workers. Results also shows that stakeholders would like to ensure that the application of fertilizers should be compliant with the rules and regulations to avoid any adverse impacts to environment.

ES 2.7.2 Public Scoping

Public Scoping was conducted on April 23, 2021 at in the Municipality of Tupi, South Cotabato. It was attended by stakeholders, personnel from Environmental Management Bureau Region 12, Local Government Units (LGUs) of Brgy. Linan and Municipality of Tupi, Non-Government Organizations (NGOs) and Proponent's representatives as identified in DAO 2017-15.

The following are the main issues and concerns raised during public scoping:

Table ES-4. Summary of issues raised during public scoping.

EIA Module	Issue/suggestion raised by the stakeholder	Sector/representative who raised the issue/suggestion	Proponent's response	Person who responded
People, Policy	There is a portion in the community wherein houses (roof) were hit by the golf ball. What is the mechanism in place to ensure protection of the residents?	Norberto Tumbiga – Brgy. Secretary	• There will be an insurance for that. Those houses, cars that will be hit and damaged by the golf ball will be remunerated. • Hospitalization will be shouldered by Brittannika just kliek before. An all expense paid. • Impose a local house rules in Hole #3 that using driver club is not allowed but other clubs is allowed. • Adjust the distance – 30 yards.	Engr. John Paul S. Tamayo, Brittannika Golf Course, Inc.
Land	What is the current classification of the project in terms of land zoning in the LGU?	Online Particpant, Carlito Y. Uy, Chamber of Commerce	• On process of conversion from agricultural to agri tourism	Engr. John Paul S. Tamayo, Brittannika Golf Course, Inc.
People	How to increase the livelihood of the community		• People in the community will be prioritrized in terms of	

			employment, however, at present majority of them are already working in the golf course.	
Project Design	Installation of solar panel		• The Solar panel is in placed. And around 60% of the Brittannika consumption is from sourced from the solar panel. • Already had – 60 % used solar	
Policy	MMT of the golf course	Online particpant (MENRO)	MMT for the golf course project is not necessary. MMT will depend on the kind of establishment (project). In terms of involvement EMB is not involved.	Rammy Lapiñas – EMB XII
			Proponent driven monitoring can be an option, wherein the team are from the community, BLGU, MLGU and other stakeholder will form part as members.	Dr. Silverion V. Magallon, Jr. – A-cubed Engineering Services
People	Publication of the preliminary perception survey result	Online Particpant, Carlito Y. Uy, Chamber of Commerce	Provide the copy of the initial result of the public perception survey to those involved stakeholders.	Rammy Lapiñas – EMB XII

Water (Consumption)	Average gallon of water needed	Mr. Rolly T. Visaya, Representative, MENRO	1000 gallons for the whole operation per day –including external ameniities and the club house	Abigail G. Sadang, Brittannika Golf Course, Inc.
			It will part of the EIA study. Next time, the volume of water consumption will be presented.	Dr. Silverion V. Magallon, Jr. – A-cubed Engineering Services
Land	Land Zoning	Engr. Efren Lauron– Planning Office	- Agricultural land is compatible with tourism - In the reclassification fo CLUP, it will be classified as parks and recreational.	Engr. Efren Lauron– Planning Office
			ECC is a requirement for the land conversion, before it will be provided with conversion certification	Dr. Silverion V. Magallon, Jr. – A-cubed Engineering Services
Land	Approval of the Land Conversion Floodings in the area with its previous crops planted utilized by the platation. But now, trees are planted in the area. No erosion was experienced.	Councilor Teresito Zabala– Chairman - Land Use	Since the land owner pulled out their land from the Plantation company, I got interested. My goal is to revive Linan. We planted trees to restore the previous face of the area. Through that flooding were minimized	Engr. John Paul S. Tamayo, Brittannika Golf Course, Inc.

ES 2.8 EIA Summary

Project Siting

- Availability of lot property - The property (existing golf course) owned by the proponent;
- Accessibility and the site is ideal for the development as it is an existing golf course;
- Abundance of skilled and semi-skilled workers in the province;
- Local Government Unit (LGU) are in favor for the development;
- The area is far from the community and free from any informal settlers and house development; and
- Basic services are available.

Technology Selection

The golf course design conforms to the international standards of quality, resource conservation and ecological safety. A prominent feature of the project is its system for water conservation and recycling that minimize water consumption, discharge, and risk of chemical contamination.

- Artificial Lake - To minimize seepage that may lead to contamination of ground water, the lake bottom is sealed through compaction of the base material and installation of non-permeable sheet material (high density polyethylene liner) with a reservoir system that holds a combine capacity of more than 7973/65 cum of water for the five (5) lagoons.

- Irrigation Water - The golf course's irrigation water is sourced from incidental rainfall**, spring that is draining to one of the lagoons, and** treated wastewater coming from the STP of the project.
- The utilization of the treated wastewater as one of the sources for irrigation of the golf course will maximize the utilization of the natural resource. At the same time, in order for the course to withstand the dry season and the torrential rain, they utilize the best quality irrigation system from the United States.

- Computer-controlled Irrigation System - The project is equipped with a weather sensing computer-controlled irrigation system that will dispense water only when the sensors detect areas with dry soil conditions. The use of this equipment is to optimize the use of water for irrigation.

- Paspalum Grass - They are also able to maintain the condition of the Paspalum without rain for more than 100 days.

Table ES-5: Summary of Key ***Environmental Impacts and Management Plan Construction***			
Land Clearing	Vegetation Removal	Provide a temporary fencing to vegetation that will be retained. Use of markers and fences to direct heavy equipment traffic in the construction site and avoid damage to plants. Implement tree planting around and near the facility with fast growing trees like Mahogany, Gmelina in coordination with DENR CENRO and PENRO more or less 100 seedlings to be planted during construction phase	100% Compliance with DENR policy
Civil Works such as Construction of Building Structures	Generation of Spoils	Designate a spoil storage within the project area which surrounded by a bund and the same will be covered to minimize siltation during heavy rains All suitable materials obtained from the excavation works will be used for the construction like backfilling Materials not use will be hauled by third party Topsoil, whenever it is available, should be removed separately from the rest of the overburden and will be used for gardening	100% No spoil materials will be left unattended
	Increase water body turbidity due to siltation caused by sediment run-off	Construction of temporary storm drainage system connected to temporary settling pond;	100% No erosion, run-off, and turbidity

		Construction of temporary settling ponds shall be constructed in the area with a dimension of 5 meters by 10 meters. During operation of the project, the same shall be dewatered, backfilled ad vegetated Construction of road network shall follow topographic contour of the area and shall be equipped with drainage directly to temporary settling pond.	within and outside the vicinity of the area.
	Generation of construction debris (including solid waste)	Provision of waste bins in conspicuous area; Installed temporary Material Recovery Facility for construction debris (including solid wastes) to be hauled by a contractor When construction is completed, the Contractor must be directed to clean up the construction site by removing all equipment and buildings and carry out site remediation work	100% hauled and collected by the third party
	Generation of Domestic wastewater	Personnel will be provided with on-site portable toilets and washrooms. Collection and disposal will be done by an accredited third party waste treater.	100% collected by accredited third party waste treaters.
	Increase in Total Suspended Particulate (TSP) within and around the project site	Conduct of sprinkling activity at least 2 times a day in the road network and exposed areas to minimize dust, source of water will come from deep well with approved permit; Impose speed limits for all heavy equipment's with a maximum of 20kph	100% Ambient air quality within DENR Standards

	Increase in SOX and NOX concentrations from vehicular emissions and other air pollution sources	Use of low sulfur fuel to reduce SOX and NOX emissions; Weekly maintenance of equipment to be in good running condition in a designated motor pool with complete facilities;	100% Ambient air quality within DENR Standards
	Potential emissions of air pollutants.	Brand new power generating equipment will be used and regular maintenance of the equipment will be conducted.	100% Emission test results within the DENR Standards.
	Noise Pollution	Use mufflers and exhaust silencers Construction works to be done during daytime only	
	Potential soil contamination due to POL (petroleum, oil, lubricants) and other hazardous wastes	Well maintained heavy equipment and machinery will be used. Provision of fuel and oil storage area with bund wall and will be collected by accredited 3rd party	100% No contaminatio n.
Operational Phase			
Operation of the Project	Generation of solid wastes from the employees and clients.	Waste Management Plan will be implemented with proper waste segregation bins, regular collection, and disposal by the third-party hauler.	100% hauled and collected by the third party
	Generation of Hazardous wastes	A storage area for hazardous wastes will be provided. Collection and disposal will be done by an accredited third party waste treater.	100% collected by third party waste treaters.
	Pesticide application may indiscriminately	• Only pesticides registration FPA and DA should be used	

	eliminate non-target organisms	• Anchor pest life cycle with pesticide application • Integrated biological methods with chemical methods in controlling pest	
	Contamination of surface and groundwater	• Proper timing of fertilizer and pesticide application • Use of organic fertilizers and pesticides • Bottom sealing of artificial lake containment set-up • Proper drainage	
	Water pollution from run-off and domestic wastes	• Construction of rainwater cisterns and collection ponds • Regular ambient and effluent water quality monitoring using DENR standards • Domestic wastewater management by connecting it to the wastewater treatment facility (WWTF). WWTF will extract the water and treat it for reuse. These will be stored in the lagoons for watering the turf grass.	
	Resource use competition for use of river water for make up water	Address resource use competition; secure water permit	
	Air pollution from equipment and vehicles and fugitive dust	• Training on power equipment and vehicle use and speed • Proper maintenance, designation of no idling zone • Routine maintenance and good house keeping	

		• use of enclosures, barriers and buffer zones • Implementation of reforestation and Carbon-sink Program • Insulate structures	
	GHG emission	• Implementation of a reforestation and carbon-sink/GHG reduction program	
	Noise from equipment and vehicles	• Enclosures for sources of noise • Provide high fence within the plant's perimeter • Provide a buffer zone on the adjoining boundaries • Planting of trees on the buffer zone and plant's perimeter that will serve as noise barrier • It is advisable that electrically-powered equipment should be preferred, where practicable, to mechanically powered alternatives. If mechanical powered plant will be used, it should be fitted with suitable silencers and mufflers; • Defective equipment/parts with abnormal noise and/or vibration will be either repaired replaced; All employees working on site will be provided with PPE	

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1. PROJECT DESCRIPTION

1.1 Project Location and Area

The proposed Brittannika Golf Course Project (referred to as the "Project") is situated at Barangay Linan, Municipality of Tupi, South Cotabato. The said first-class municipality is hailed as Fruit and Flower Basket of the Province of South Cotabato and is subdivided into fifteen (15) barangays, and Barangay Linan occupies 10.27% of the municipality's total land area.

Nestled below the 2,286-meter-high stratovolcano Mount Matutum, the municipality is surrounded by five administrative divisions of the Province of South Cotabato, and one municipality of the Province of Sarangani. Tupi is bounded by the City of Koronadal in the northeastern side, Tampakan in the northern part, Banga in the west, T'boli in the south, and Polomolok in the southeastern portion. Meanwhile, Malungon, Sarangani Province serves as Tupi's boundary on the eastern side. Figure 1-1 shows the boundaries of the barangays in the Municipality of Tupi. Meanwhile, Figure 1-2 shows the regional boundaries, and Figure 1-3 shows the project site location in the country.

The project location is outside the protected area situated in a titled property owned by the company. The geographic coordinates of the project's boundaries are presented in Table 1-1. The corresponding map of the project boundaries is presented in Figure 1.4.

TABLE 1-1. GEOGRAPHIC COORDINATES OF THE PROJECT BOUNDARIES

CORNERS	LATITUDE	LONGITUDE
1	6°22'59.6424"N	124°58'44.3604"E
2	6°22'52.0068"N	124°58'51.438"E
3	6°22'55.1928"N	124°58'54.804"E
4	6°22'44.1192"N	124°58'64.8336"E
5	6°22'41.0556"N	124°58'61.9068"E
6	6°22'35.2056"N	124°58'56.1828"E
7	6°22'43.914"N	124°58'47.5752"E
8	6°22'44.3136"N	124°58'48.1008"E
9	6°22'54.6348"N	124°58'38.9172"E

1.1.1 Site Accessibility

The Municipality of Tupi is located approximately 24 kilometers from the City of Koronadal – the capital of the province and the regional administrative center of SOCCSKSARGEN Region, and 37 kilometers from the City of General Santos – a major urban center and gateway in the region where the nearest airport and seaport are located. The site for the project can then be traversed from the town proper by the access road going to Barangay Linan. Figure 1-5 shows the accessibility of the project area.

FIGURE 1-1. MAP SHOWING THE BARANGAY BOUNDARIES IN THE MUNICIPALITY OF TUPI

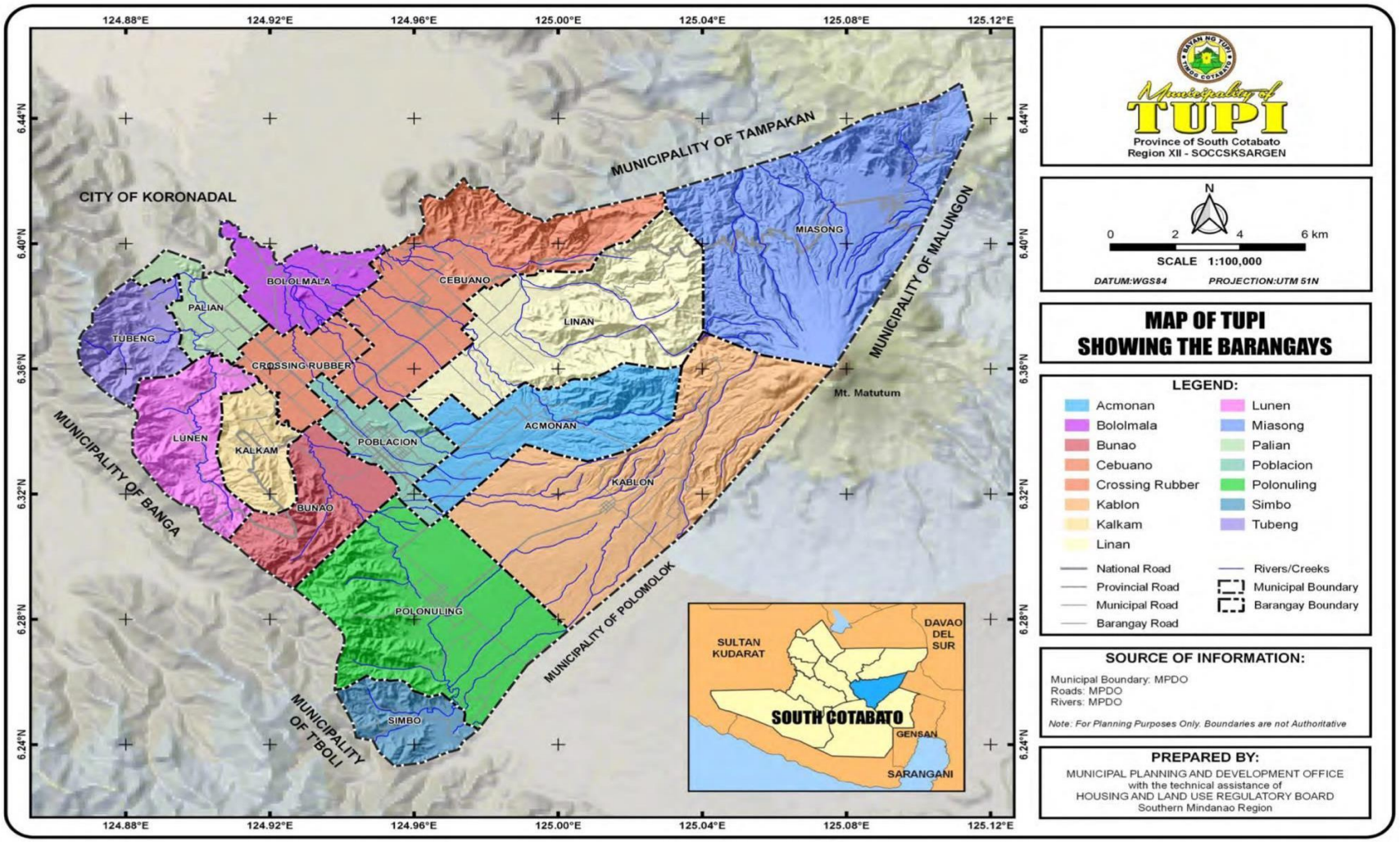


FIGURE 1-2. MAP SHOWING THE PROVINCE OF SOUTH COTABATO

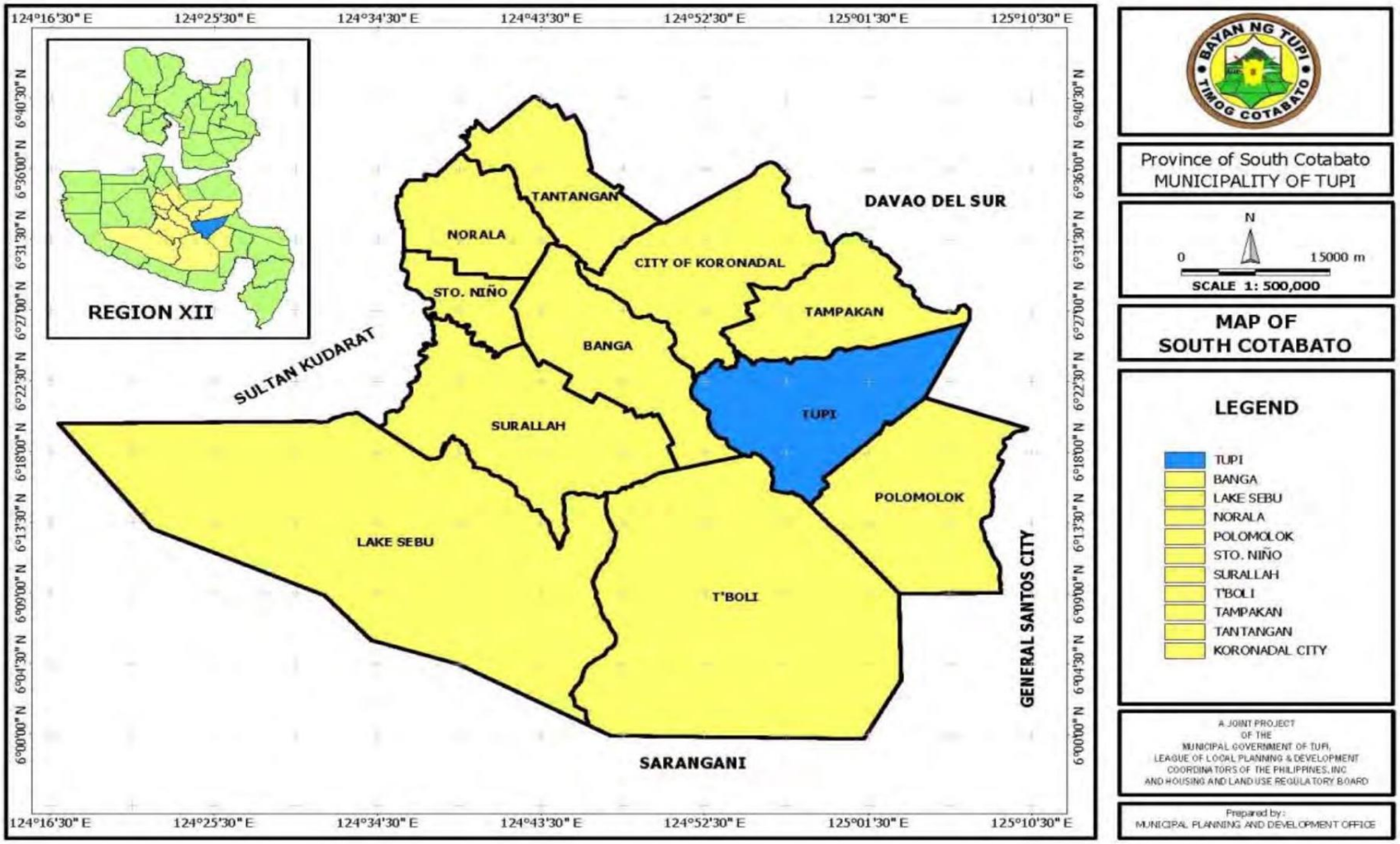


FIGURE 1.-3. LOCATION OF THE PROJECT IN THE MAP OF THE PHILIPPINES

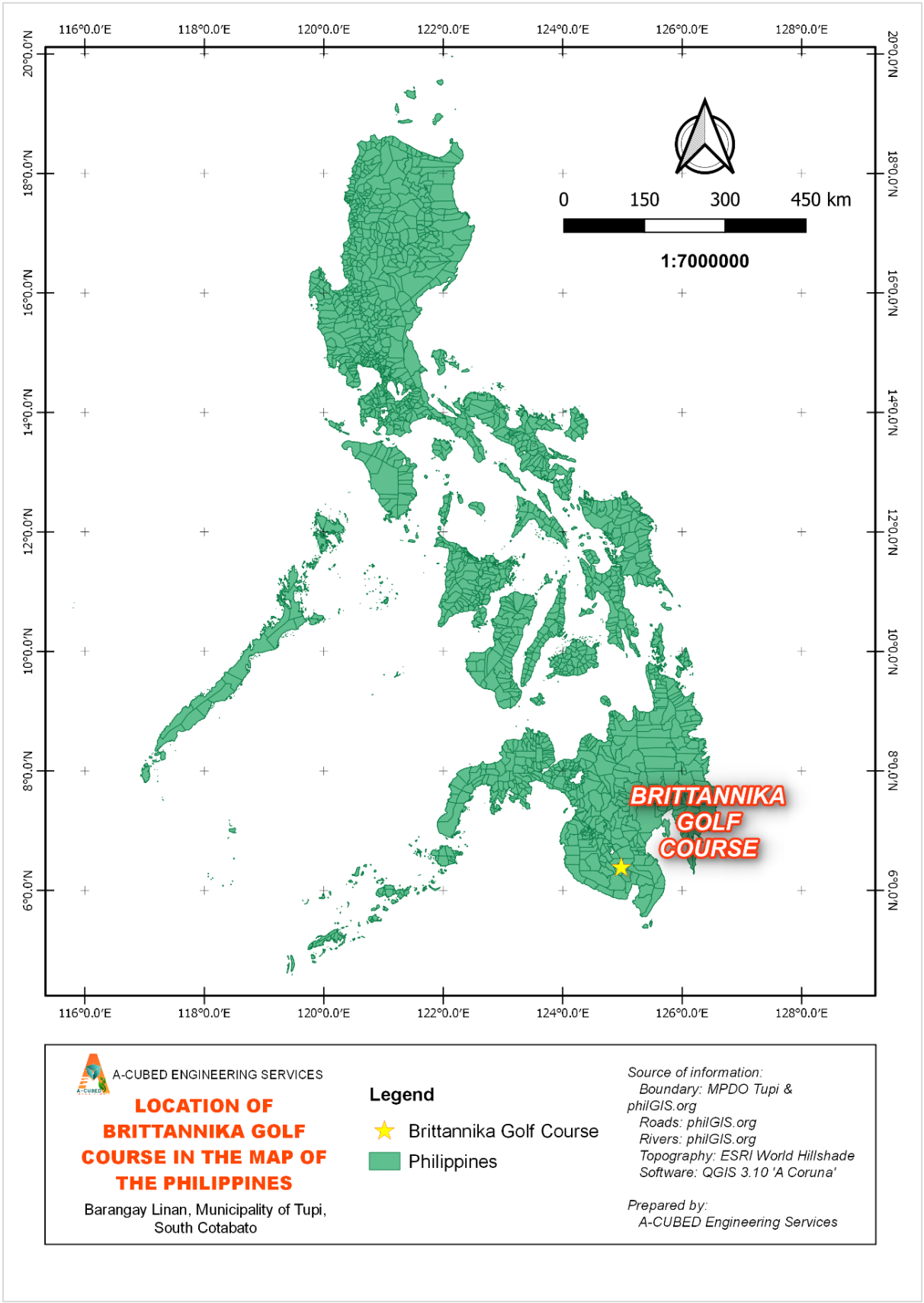


FIGURE 1-4. BOUNDARIES THE PROJECT AREA

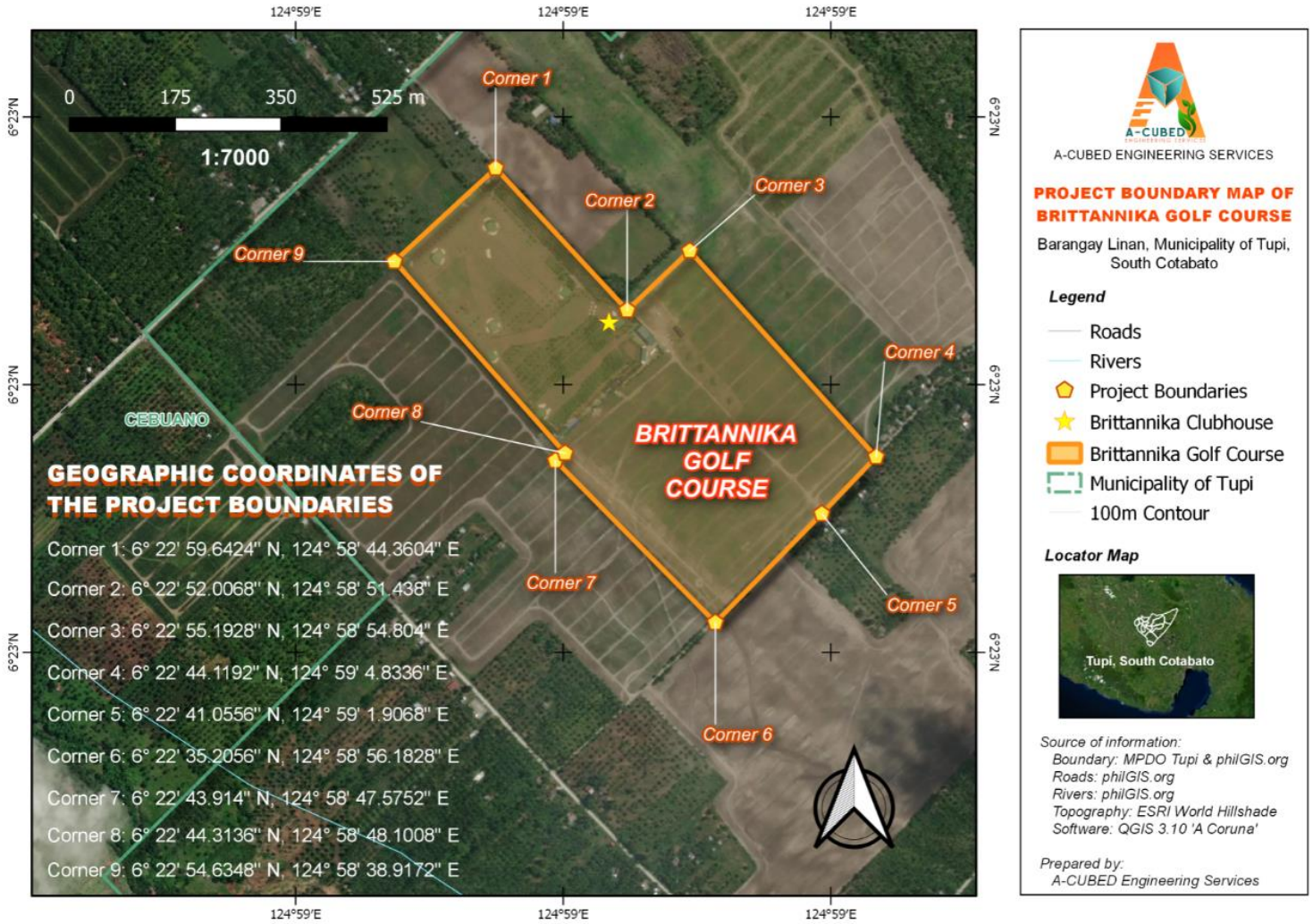
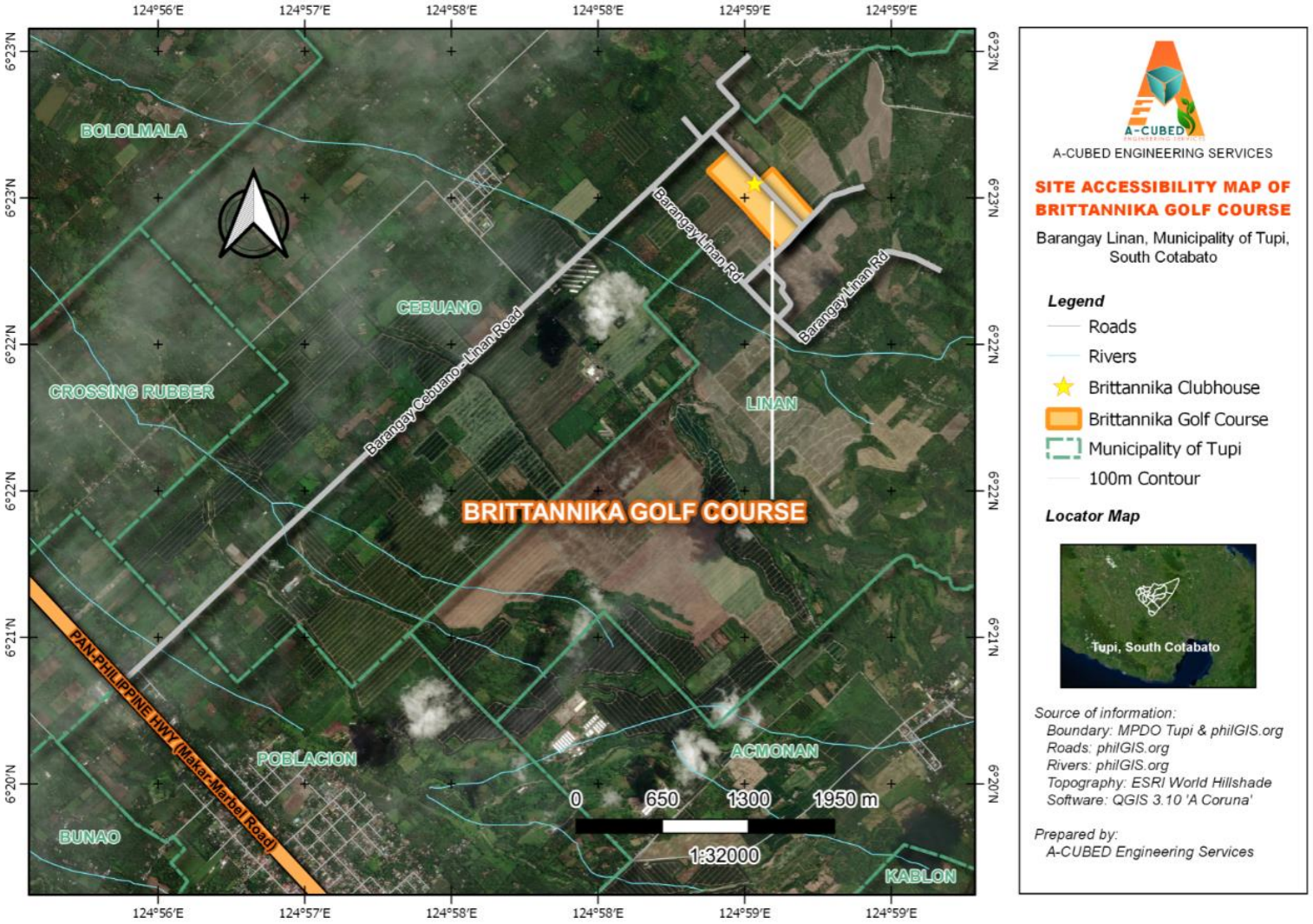


FIGURE 1-5. ACCESS ROAD TO THE PROJECT SITE



Brittannika Golf Course
Purok Pag-asa, Barangay Linan, Tupi, South Cotabato

1.1.2 Delineation of Impact Zones

In accordance with the Department of Environment and Natural Resources (DENR) Administrative Order (DAO) 2003-30 and DAO 2017-15, the potential impact areas of the project – both direct and indirect – were determined and demarcated.

The direct impact area will be delineated based on the results of the assessment of the project's impacts on different aspects: air, water, land, and people.

1.1.2.1 Impacts on Air Quality

The project's direct impact area with respect to air quality will be the areas with potential ground level concentrations (GLCs) of emissions higher than the ambient standards at worst case scenarios. With regards to air quality during construction and operation phases, the golf course project's potential impact area will include the expanse of Barangay Linan, and the bordering Barangay Cebuano in the Municipality of Tupi. Direct impact area on air quality for the project is presented in Figure 1-6.

1.1.2.2 Impacts on Water Quality and Quantity

The extent of water bodies where the water quality is projected to exceed the ambient standards based on relevant worst case scenario discharge modeling studies will be part of the project's direct impact area. Also, areas using the groundwater that could possibly be contaminated by project activities involve the use and disposal of toxic chemicals and hazardous waste will be part of the direct impact area, as well as areas where there are existing users of surface and groundwater sources that the proposed project will be using.

The project's direct impact areas related to water quality and quantity will be the totality of the project site since the groundwater source is directly situated within the compound, as well as the nearest freshwater body – the Cabizares Creek which will be the potential receiving waterbody in case of uncontained discharges of pollutants from the golf course. Since the water table is relatively too deep due to the considerably high elevation of the area, groundwater sources nearby are less likely to be affected by the project. Figure 1-7 describes the potential direct impact area concerning water quality.

1.1.2.3 Impacts on Land

Direct impact areas with respect to the land usage will be the areas that are directly susceptible to potential flooding or inundation that may be caused by the project, and such areas where there will be disturbance of habitat. In this case, the project's direct impact area on land will be the 22.3-hectare golf course area which includes all the project components located within, as shown in Figure 1-8.

1.1.2.4 Impacts on People

Areas that will be directly affected with respect to the socio-economic aspect of the project will be the project's direct impact area for people. Since the project will be considered as one of the major economic improvements in the area, several job opportunities will open for the residents not only in Brgy. Linan, but also in the whole Municipality of Tupi. Further, revenues generated by the project and the influx of

ecotourism visitors would greatly benefit the Municipality. Figure 1-9 presents the direct impact area of the project on the socio-economic aspect.

Based on the provisions of the abovementioned guidelines, the Figure 1-10 represents the delineated impact areas which affect the physical and social environment of the project site and the neighboring areas. Moreover, indirect impact areas of the project include the areas that are immediately or completely affected by the project, and can be more technically define through thorough environmental assessment such as dispersion or transport modelling once the EIA study is completed. Table 1-2 generally describe the impact areas for the golf course project.

TABLE 1-2. IMPACT AREAS FOR BRITTANNIKA GOLF COURSE PROJECT

IMPACT AREAS	BIOPHYSICAL IMPACTS	SOCIAL IMPACTS
DIRECT	● The 22.3-hectare golf course area ● Neighboring areas situated in Barangay Linan and Brgy. Cebuano, Tupi where water and air quality can potentially be affected and areas surrounding the project site which will be affected by the impacts of noise and air pollution during construction and operation	● Residents of Barangay Linan whose health, employment, and livelihood will be impacted by the construction and operation of the project ● The Municipality of Tupi which will benefit from the revenues of the project and the influx of ecotourism visitors
INDIRECT	● Nearby water bodies and watersheds located outside the direct impact area on water quality, such as major rivers that serve as receiving waterbodies for tributaries and creeks within the direct impact area ● Surrounding agricultural lands, particularly pineapple plantations ● Neighboring barangays of the municipality	● Neighboring towns, and cities in South Cotabato that can benefit from prospective revenues of the project ● Other communities that can benefit from the possible employment and livelihood opportunities arising from the construction as well as operation of the project

FIGURE 1-6. PROJECT'S DIRECT IMPACT AREA ON AIR QUALITY

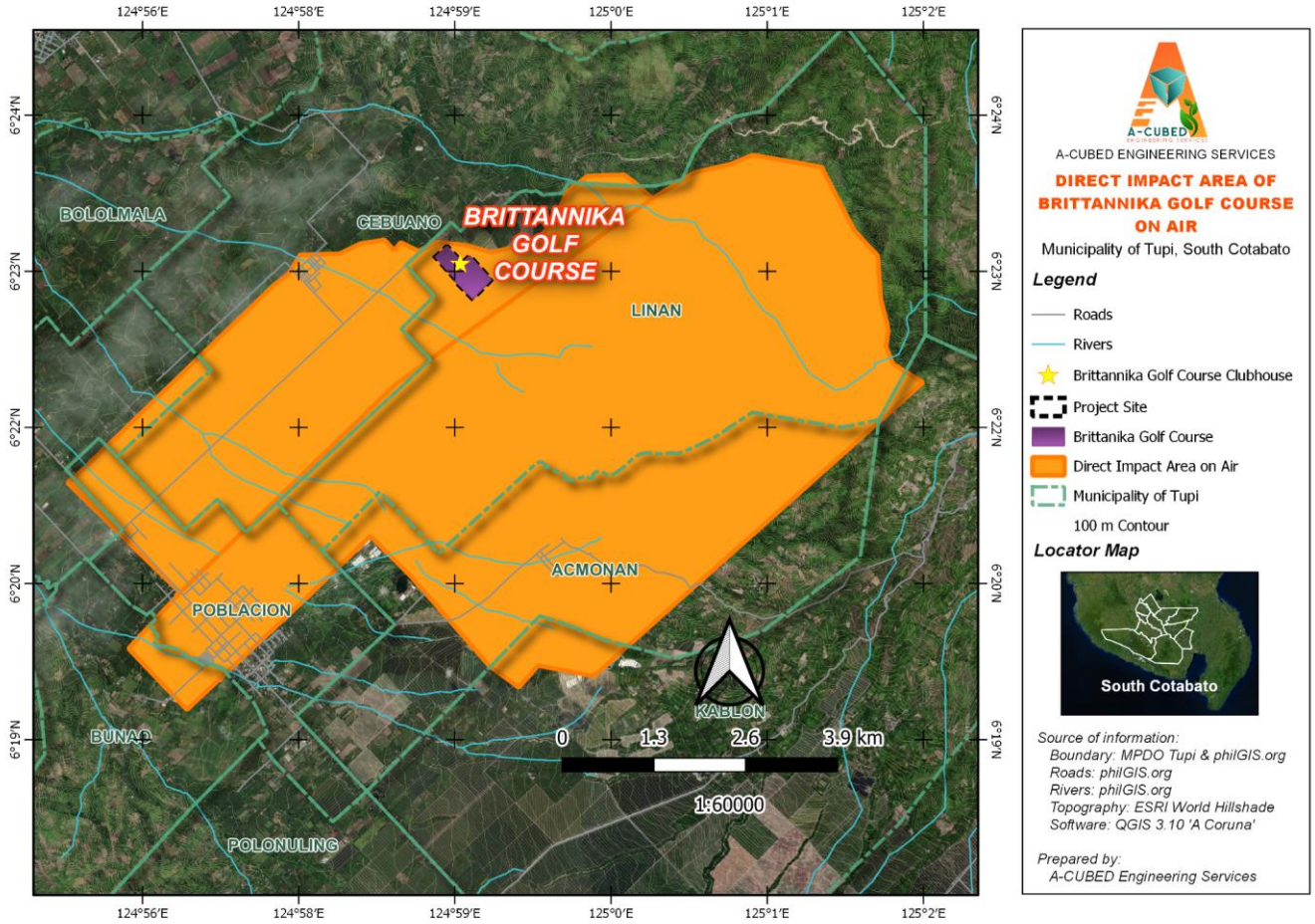


FIGURE 1-7. PROJECT'S DIRECT IMPACT AREA ON WATER QUALITY

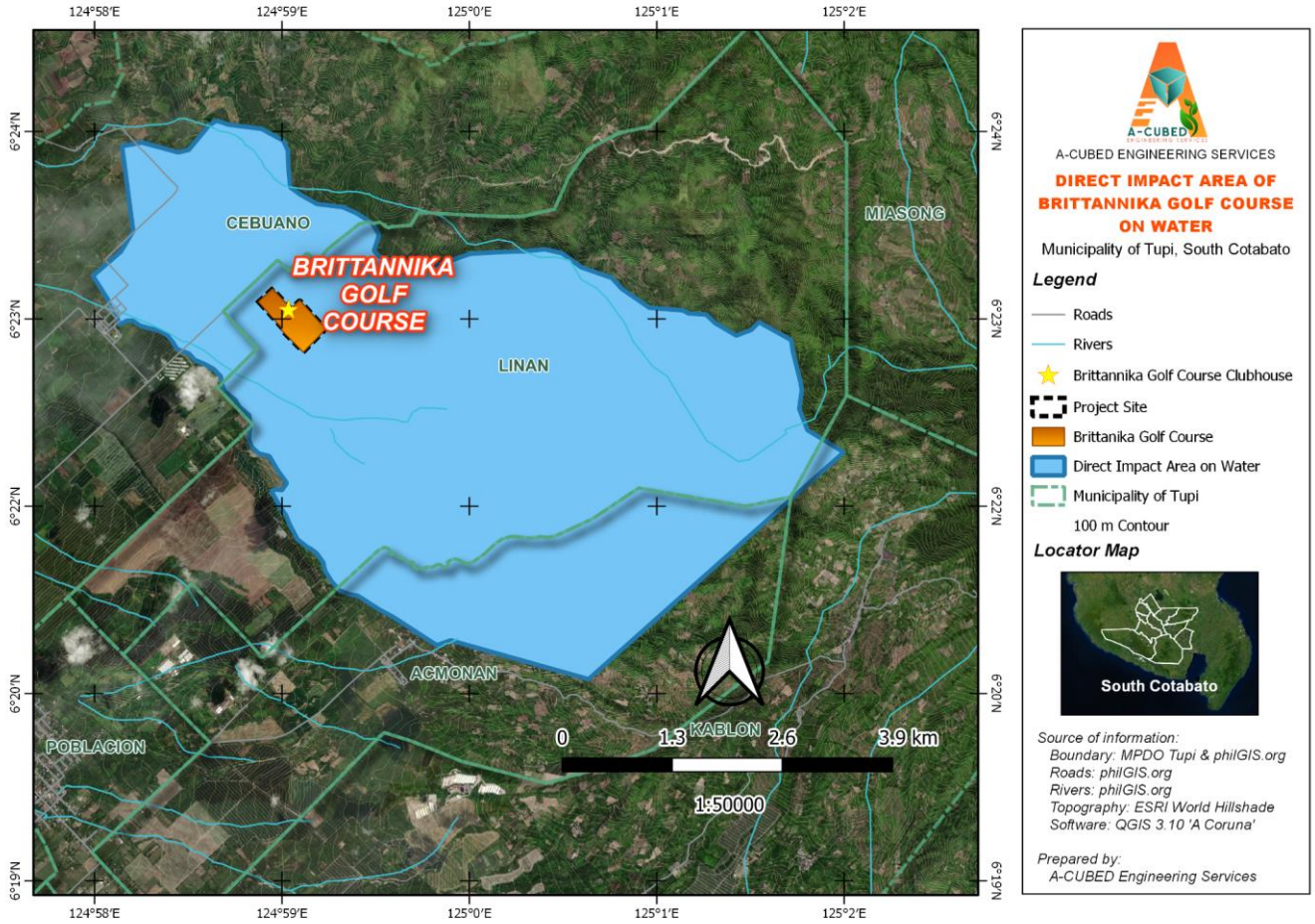


FIGURE 1-8. PROJECT'S DIRECT IMPACT AREA ON LAND

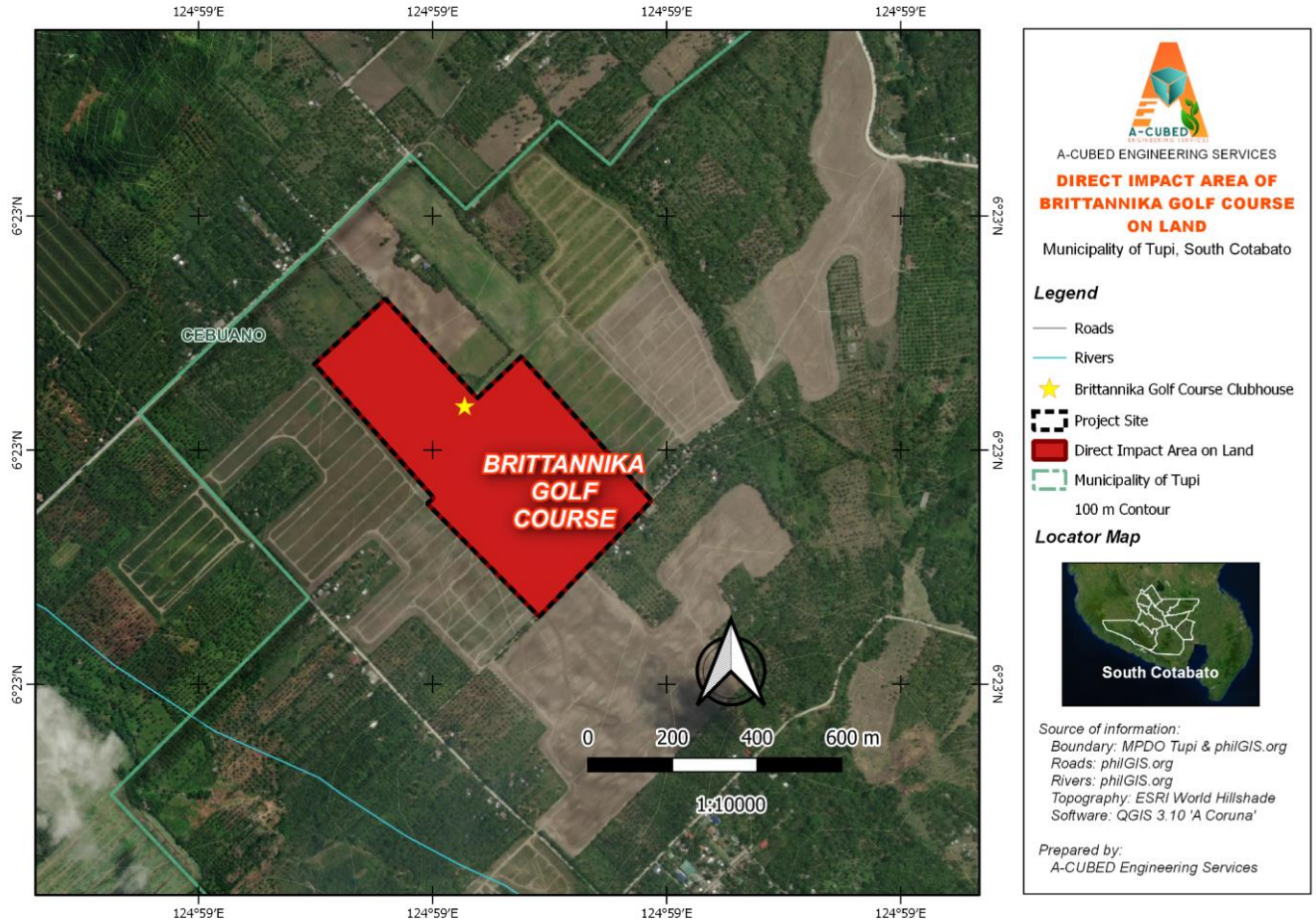


FIGURE 1-9. PROJECT'S DIRECT IMPACT AREA ON PEOPLE

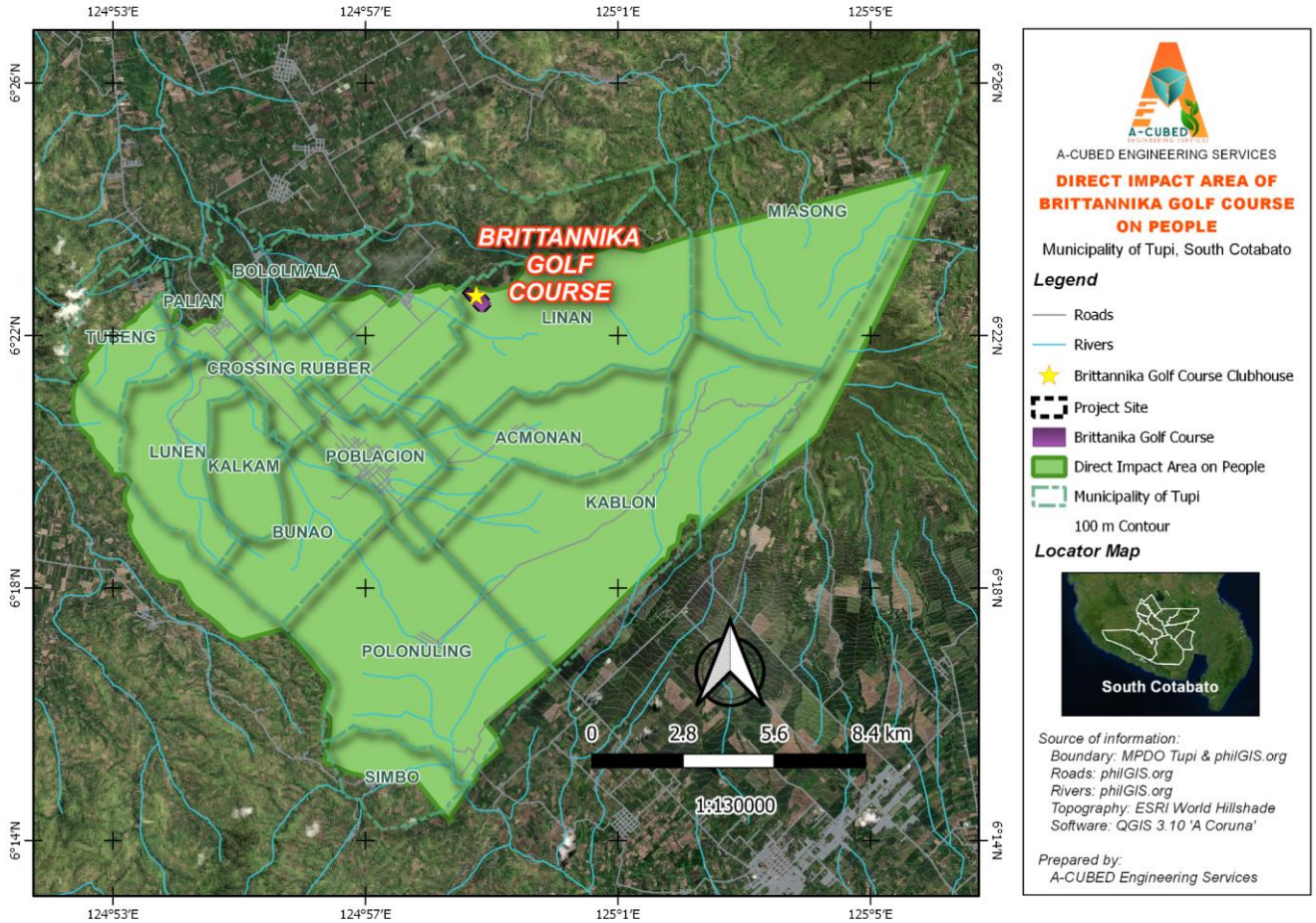
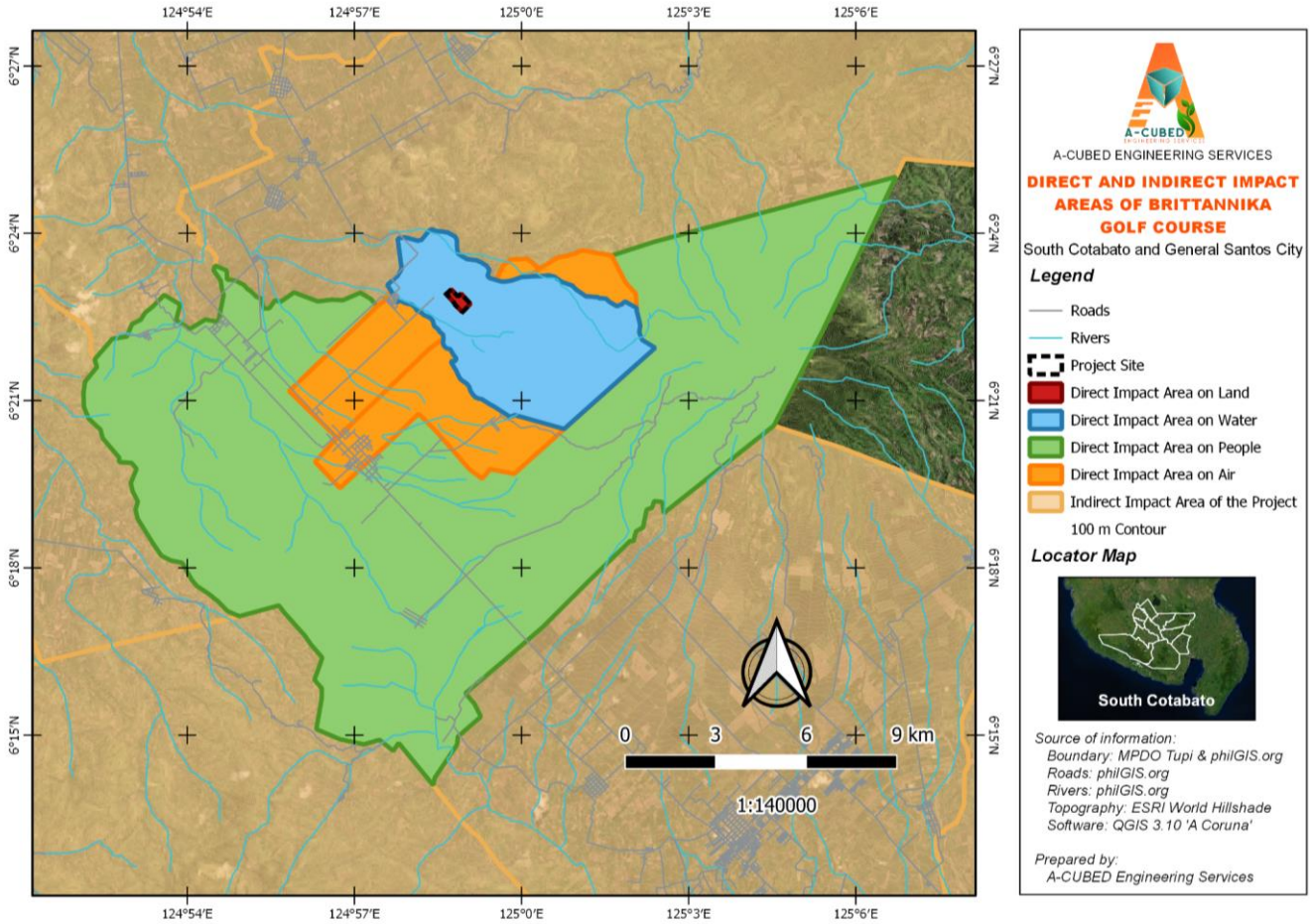


FIGURE 1-10. DETAILED DESCRIPTION OF THE PROJECT'S DIRECT AND INDIRECT IMPACT AREAS



1.2 Project Rationale

The golf course project is planned to be commercially engaging while still keeping a substantial amount of the expanse as lush, visually pleasing green space. The project is envisioned to offer recreational facilities that are secure and environmentally sustainable. With this, the overall value of the land, property, and surroundings in the area can be increased and enhanced while still maintaining harmonious coexistence with the nearby residential areas.

The said project is situated in Barangay Linan, one of the up-and-coming eco-tourism sites in the Municipality of Tupi being developed. The barangay hosts one of the major sanctuaries of tarsier in the region, as well as other rising ecotourism destinations. The developments brought about by the project are planned to complement and improve the current natural status of Barangay Linan's environ, while still providing excellent recreational services to visitors and tourists.

Aside from this, the project's construction and operation would likely offer an increase in job opportunities and livelihood particularly for the residents of Barangay Linan. The completion of the project will also make way for the upsurge in the generated revenues of the barangay and the Municipality of Tupi, and augment the local economic growth through sustainable eco-tourism.

1.3 Project Alternatives

1.3.1 Project Siting/Location

The lot property where the project is situated was previously used for the plantation of the pineapple. Since the current project site/location was already established before the project, the proponents instead selected among a wide array of alternatives for the usage of the land, and which among these options would entail better socio-economic development and returns, while still minimizing significant environmental impacts. Table 1-3 summarizes the project alternatives for the existing project site.

TABLE 1-3. COMPARISON OF PROJECT ALTERNATIVES

ASPECTS/ FACTORS CONSIDERED	PINEAPPLE PLANTATION (NO CONVERSION)	GOLF COURSE	HOUSING COMPLEX/ SUBDIVISION
Terrain/ Landscape	● Regular land cultivation, tilling, and preparation is required every crop cycle	● Terrain is almost established and minimum earth filling activities required to meet the golf course landscape	● The original landscape needs major adjustments to make the area feasible for the construction of subdivision

Air and Water Quality	• Potential pollution from residue pesticides and fertilizers brought by agricultural runoffs	• Potential localized air and water pollution from construction, operation and maintenance of the golf course project which can be mitigated through proper management	• Significant pollution from the per capita generation of domestic wastes due to large population
Socio-economic	• There is extensive competition for the market in pineapples in the region, particularly in Tupi and the neighboring town Polomolok • Employment opportunities are exclusive to farmers and laborers in the area	• Huge employment opportunities for the residents in the Muncipality of Tupi • Revenues and taxes can greatly contribute to the economy of the barangay/town	• Extensive employment opportunities only limited to the construction phase of the project
Resource Utilization	• Adequate supply of resources like water, agricultural inputs, fuel for machineries, etc. are needed to cover the whole farm area	• Requires substantial amount of water for different uses but can be tapped from rainwater or underground sources • Power needed for operation can be distributed by	• Large-scale utilization of water and power resources are needed to be supplied to a large number of residential houses

		the local electric cooperative, by the standby generators, or from renewable sources like solar panels.	
Project Cost and Revenue	● Only operation and maintenance cost are required since no conversion is needed ● Revenues are dependent on the yield of crop, and the current market value	● Project entails significant costs from construction, operation and maintenance but can gradually be returned due to constant visitor influx and minimal competition	● Huge amount of capital is necessary for the construction of hundreds of houses

Project alternatives were considered for the usage of the existing 22.3-hectare lot property, however, based on the comparison presented, the golf course project showed to be the most ideal as it provides the most socio-economic benefits, and the environmental impacts can be mitigated since the project requires thorough management.

Since golf is becoming more popular as a form of leisure and recreation, the demand for local golf courses has been increasing throughout the years, specifically in the Province of South Cotabato. Currently, there are two golf courses in the province offering such amenities – Dole-Kalsangi Golf Club and Paraiso Golf Club.

Dole-Kalsangi Golf Club is situated at the foot of Mount Matutum in Polomolok, and is surrounded by the pineapple plantation of Dole Philippines. The said golf course is approximately 18.26 kilometers away from Brittannika Golf Course. The Paraiso Golf Club is a nine-hole golf course situated in a 53-hectare expanse in Purok Marivilles, Brgy. Paraiso, City of Koronadal. The golf course is about 22.48 kilometers away from Brittannika Golf Course.

Figure 1-8 shows the location of the two existing golf courses in the province, as well as the Brittannika Golf Course. The proposed project will be a new addition that will appeal to players seeking an exciting and interesting recreational activity in a well-landscaped golf course and excellent facilities.

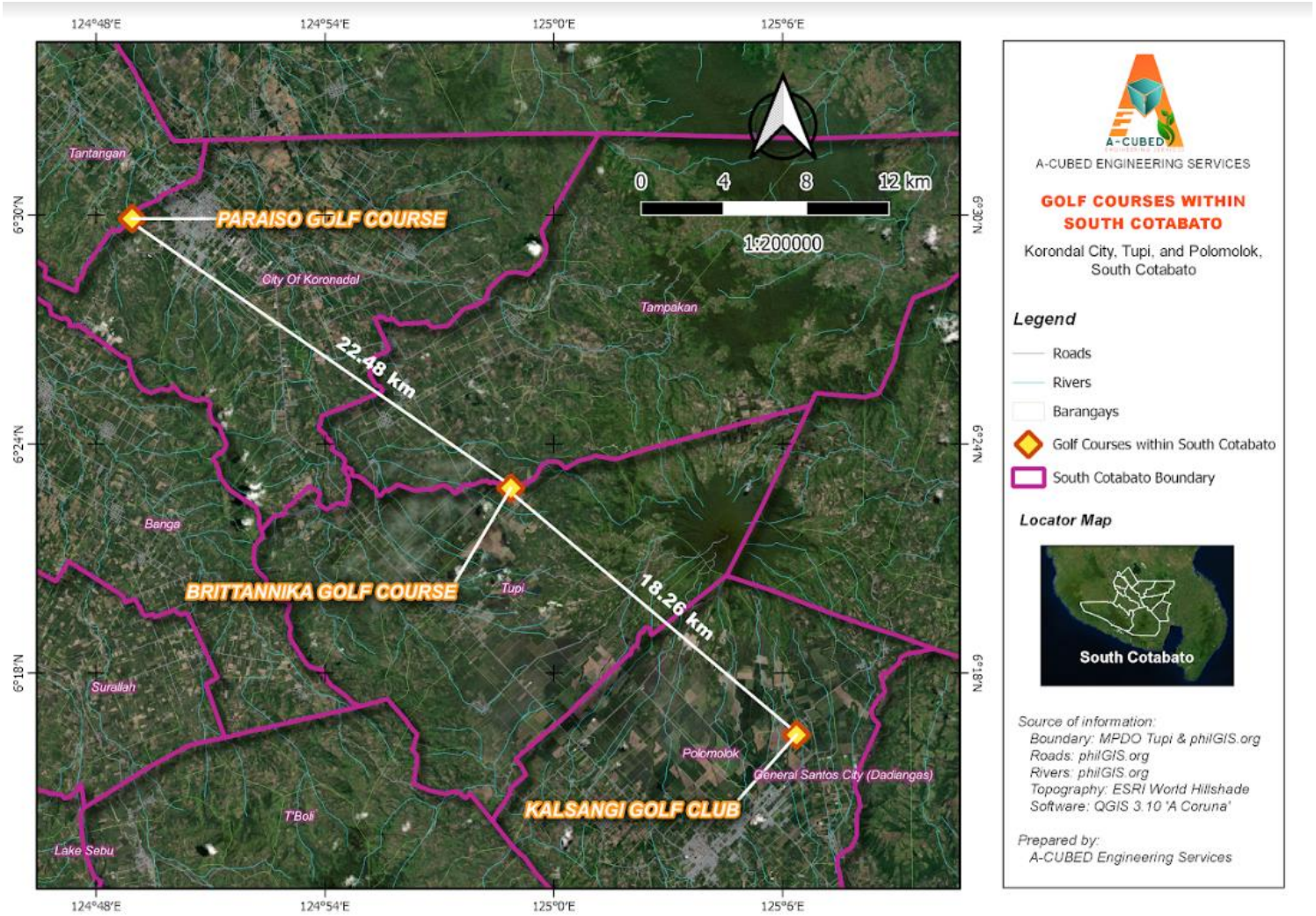
1.3.1.1 Severity of Impacts

The degree of future implications and impacts based on project siting options is abated due to the following:

1. Because the proposed area is dormant and privately-owned, no communities will be relocated;
2. No indigenous groups are inhabiting the area; and
3. The area utilization is in accordance with the municipality's land usage.

A comprehensive matrix of the project's impacts concerning different aspects is presented in Chapter 4 of this study.

FIGURE 11. GOLF COURSES IN SOUTH COTABATO



Brittannika Golf Course
Purok Pag-asa, Barangay Linan, Tupi, South Cotabato

1.3.1.2 Perception of the Affected Communities

As part of the requirements for the implementation of the project, Brittannika Golf Course, Inc. conducted a half-day public scoping session on April 23, 2021, at Tupi Supreme Activated Carbon Plant, National Highway, Station 4, Barangay Kablon, Tupi, South Cotabato. The public scoping was predominantly attended by representatives from the community, schools, women, local government units at the barangay and municipal levels, government agencies, and other stakeholders.

The activity's primary objective was to discuss the project's details to the communities affected and encourage discussion among stakeholders to help guide the conduct of the environmental impact assessment study.

Also, it was emphasized that the project is well-suited with the municipality's land use and that no residents will be displaced. Furthermore, it was discussed that 100 percent of the respondents were in favor of the project based on the public perception survey conducted on January 9, 2021.

1.3.2 Technology Selection/ Operation Processes

Pollution control systems required during the operation of the project include a waste management plan and wastewater treatment facility that will be constructed in the vicinity, as well as an option for connecting the effluent outflow to Brittannika Golf Course's treatment facility.

The design and layout of the proposed golf course will adhere to international quality standards, efficient utilization and conservation of natural resources, and environmental safety. The project's water conservation and recycling system, which will reduce water usage, discharge, and the danger of chemical contamination, is a standout feature.

The golf course design conforms to the international standards of quality, resource conservation, and ecological safety. A prominent feature of the project is its system for water conservation and recycling that minimizes water consumption, discharge, and risk of chemical contamination. Table 1-4 summarizes the technology and process alternatives for the project.

TABLE 1-4. TECHNOLOGY AND PROCESS SELECTION

COMPONENT	ALTERNATIVES	DECISION CRITERIA
Artificial Lake Lining Material	Alternative 1: Polyvinyl Chloride (PVC)	Relatively cheaper, and highly flexible, but liner degrades when exposed to UV/sunlight and requires soil cover.
	Alternative 2: Clay and Bentonite	Needs a sufficient local supply of clay, and considerations on slope, groundwater levels, and erosion must be taken into account.

	Alternative 3: High-Density Polyethylene (HDPE) *(selected)*	Most widely used geomembrane with excellent chemical resistance, UV stability, and relatively available
Irrigation Water	**Alternative 1: Rainwater/ Springwater** *(selected, primary)*	Incidental rainwater collected within the lagoons can be used for the irrigation of the golf course to maximize use of resources
	Alternative 2: Treated wastewater *(selected, secondary)*	Water recycling will be employed to further lessen the usage of freshwater and to augment water supply for irrigation during dry season
	Alternative 3: Groundwater	Groundwater supply may be limited if used for large-scale uses; can be tapped for domestic usage only
Irrigation System	Alternative 1: Manual irrigation	Requires additional manpower to manually irrigate the whole area, and over-usage of water may be possible
	Alternative 2: Computer-controlled *(selected)*	Set-up and installation is expensive, but removes the need for more manpower, and optimizes the use of water based on soil conditions,
Golf Turf	**Alternative 1: Paspalum and Bermuda Grass** *(selected)*	Easy to maintain and can help in erosion control
	Alternative 2: Synthetic Turf	Can save costs on chemicals and water but has shorter shelf life

- **Artificial Lake Lining Material.** To minimize seepage that may lead to contamination of groundwater, the lake bottom is sealed through compaction of the base material and installation of non-permeable sheet material, in this case, high-density polyethylene liner is selected. The lake is equipped with a reservoir system that holds a combined capacity of more than **7973.65 m^3** of water for the five (5) lagoons.
- **Irrigation Water**. The golf course's irrigation water is sourced from incidental rainfall or spring water that drains to one of the lagoons and treated wastewater coming from the STP. The utilization of the treated wastewater as one of the sources for irrigation of the golf course will maximize the use of the natural resources. At the same time, for the course to withstand the dry season and the torrential rain, they will utilize the best quality irrigation system from the United States.
- **Computer-controlled Irrigation System**. The project is equipped with a weather sensing computer-controlled irrigation system that will dispense water only when the sensors detect areas with dry soil conditions. The use of this equipment is to optimize the use of water for irrigation and remove the need for additional manpower.

- **Paspalum and Bermuda Grass.** Natural turfs have better advantages over synthetic ones. The condition of the Paspalum can be maintained even without rain for more than 100 days. The synthetic turfs are very expensive for a very wide area of application, and the costs cannot be easily returned by the savings from water and chemicals. Also, they radiate more heat than natural grasses, which may cause inconvenience to the golfers.

1.3.3 Resources

1.3.3.1 Source of Power Supply

Adequate backups in transmission and distribution will be implemented in the detailed design stage to ensure high consistency of power supply throughout the operation. South Cotabato Electric Cooperative (SOCOTECO), the local distribution utility, can provide electricity for the project. A standby generator will also be used in case of power interruption, and a secondary supply generated from solar energy will also be utilized. A monthly average of 5500 kWh will be consumed by the operation of the golf course.

1.3.3.2 Water Supply and Demand

During the operating phase, water may be obtained from the local water concessionaire. The supplementary amount may be sourced from the existing groundwater pumps in the vicinity. With this, there is an adequate supply of water in the area to meet the planned project's water requirements. Rainwater collection and harvesting will be used to the greatest extent feasible, including the building of enclosed artificial lakes for irrigation of the golf course. Also, reusing treated wastewater for irrigation of the area is deemed feasible.

Since the country located in the tropics and is frequented by several typhoons yearly, as well as the southwest monsoons, rainy seasons provide a huge opportunity to cut costs on water by maximizing the collection of rainwater and storing them into the artificial lakes which can be useful during the dry season. The golf course area will be equipped with drainage systems that are designed to channel the water into nearby artificial lakes. Runoffs from the rooftops of the clubhouses and other buildings can be pumped into storage that can hold a few hundred up to a few thousand liters of water at a time. This free water may subsequently be utilized for a variety of purposes, including cleaning golf carts, irrigating greens, and even flushing toilets.

On average, approximately 18,378.13 cubic meters of water per month – both for domestic and non-domestic uses will be utilized. Since the majority of the water is sourced from surface water sources such as rainwater, and recycled treated wastewater, the water supply of the neighboring communities is not put into risk.

1.3.3.3 Agricultural Inputs

If applied incorrectly, nitrogenous fertilizers used to turfgrass might endanger groundwater. In order to prevent runoff and erosion, as well as fertilizer and pesticide leaching, a comprehensive management program must take into account a variety

of environmental and other aspects. The danger of pollution of our water resources can be reduced with good management.

The use of a slow-release nitrogen source for the fertilizer will be employed. It has the advantages of lowering labor expenses by reducing the number of treatments, as well as reducing the risk of foliar burn, giving a more consistent supply of nitrogen, and lowering nitrogen leaching. Since most of the greens that are already established for two years, they generally require 1.5 to 3 kg nitrogen per 100 sq. m. per year In this case, the annual peak nitrogen requirement for fertilizer application in the golf course is approximately 2750 kg N, which translates to 19.6 tons of fertilizer at 14% nitrogen content.

1.3.4 Comparison of Alternative Options

The result of the comparison of the two (2) alternative options is shown in Table 1-5. Without the project, the area will remain idle or will be converted into another usage. The project implementation will turn the area into a well-maintained landscape and will generate jobs for the local community and nearby municipalities.

TABLE 1-5. COMPARISON OF ENVIRONMENTAL IMPACTS OF THE TWO ALTERNATIVE OPTIONS – WITH THE PROJECT, OR WITHOUT THE PROJECT

Alternative Items	Environmental Impacts	
	OPTION 1 **With the Project**	**OPTION 2** **Without the Project**
Siting	● The project will generate jobs for the local and nearby communities ● Site accessibility and basic services are readily available	● Accessibility and basic services of the area will remain or the same even without the project. The road is presently used by the stakeholders located near the project and even without the said project, homeowners and other institutions can still utilize them for other purposes.
Development Design	● The golf course design conforms to the international standards of quality, resource	● The golf course will vanish and the area will become idle or will be developed into other uses such as for

	conservation, and ecological safety. ● The beautiful landscape will be maintained in the area.	industrial or commercial purposes.
Process/Technology Selection	● A prominent feature of the project is its system for water conservation and water recycling that minimizes water consumption, discharge, and risk of chemical contamination.	N/A
Resource Utilization	● Efficient utilization of water, electricity, pesticides, and fertilizers	N/A

1.3.4.1 No Project Alternatives

The 'no-go' option is the alternative of relinquishing the proposed project. This option will result in the project site remaining in its current condition, which is needing of any development. Because the property is underused, no yield is projected, implying no profit and no revenue increases for the local government.

The planned project will provide a massive economic boost not only to Tupi's municipal government but also to the provincial and regional levels. The economic advantages such as employment, livelihood alternatives, social support systems, and income for the local government as project funding will not be sought if the project is not implemented.

However, in the case that the proposed project is not materialized, the property will remain as a pineapple plantation. Process involved will only be limited to regular land cultivation, tilling, and preparation is required every crop cycle. There is still potential pollution from residue pesticides and fertilizers brought by agricultural runoffs, similar to the golf course. Much like a golf course, an ample supply of resources, such as water, agricultural inputs, machine fuel, are still required to cover the entire expanse.

On the downside, employment opportunities are only limited to local farmers and laborers, and there is competitive pressure for the pineapple market in the region,

particularly in Tupi and the neighboring town of Polomolok. As a result, revenues are dependent on the yield of crop, and the current market value of pineapples. Without the golf course project, the development in the eco-tourism of Barangay Linan is significantly hampered, which could have played a great role in the influx of visitors in the area and result into income for the residents, the barangay, and the Municipality of Tupi.

1.4 Project Components

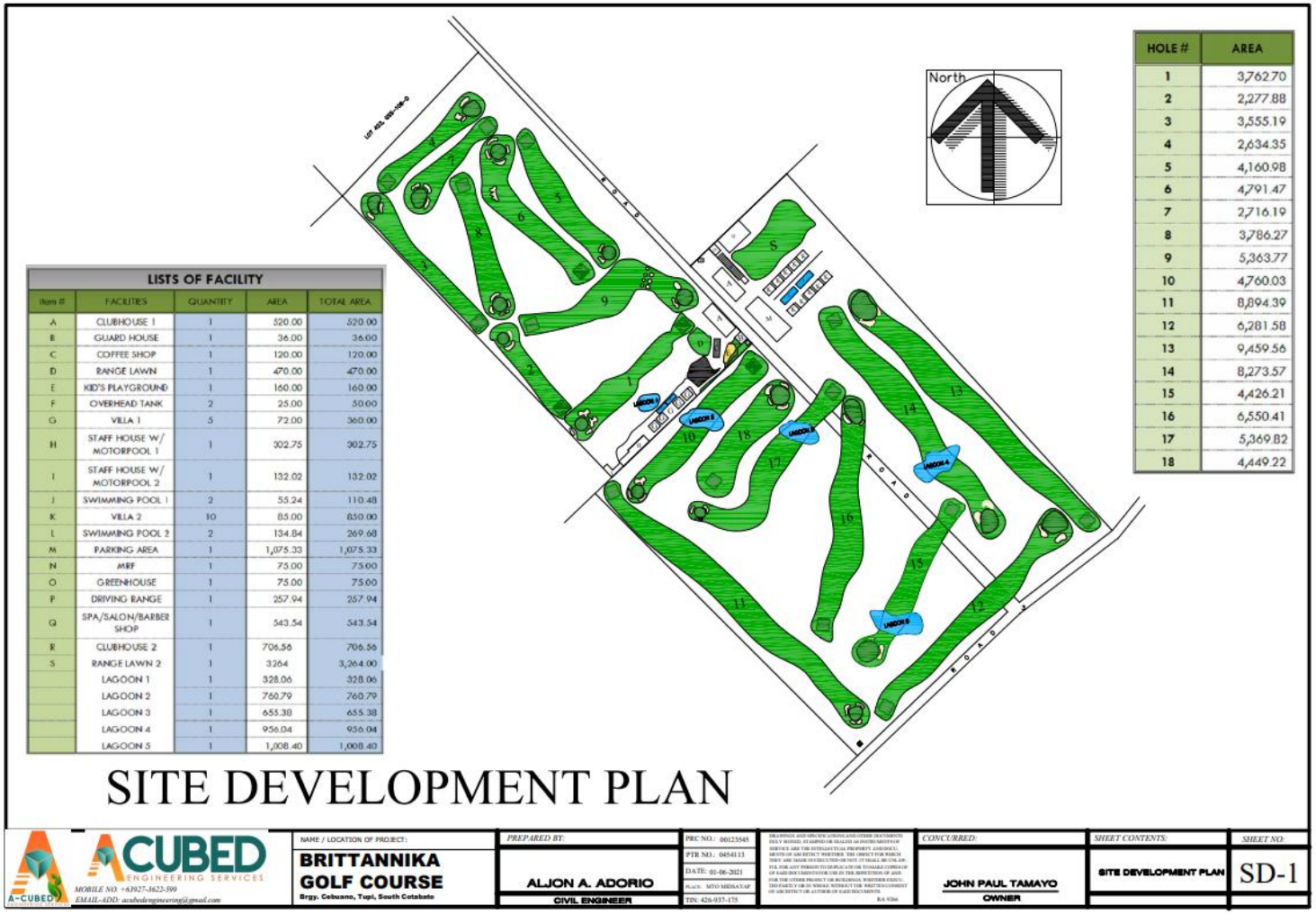
1.4.1 Major and Support Facilities

Table 1-6 below lists the various components that make up the 22.3-hectare Brittannika Golf Course. Figure 1-12 presents the Site Development Plan of the project.

TABLE 1-6. PROJECT COMPONENTS

FACILITIES	TOTAL AREA/ CAPACITY
Eighteen (18) holes (Golf range);	**22.3 hectares**
Two(2) unit Clubhouse;	**1226.56 sq. m.** part of 22.3 has.
One (1) unit Power Supply;	
One (1) unit Parking Area	**1075. 33 sq. m.** part of 22.3 has.
One (1) unit Material Recovery Facility	**75 sq. m.** part of 22.3 has.
One (1) unit Greenhouse;	**75 sq. m.** part of 22.3 has.
One (1) unit Coffee Shop	**120 sq. m.** part of 22.3 has.
One (1) Guard House	**36 sq. m.** part of 22.3 has.
One (1) Children's playground	**160 sq. m.** part of 22.3 has.
Fifteen (15) Guesthouses (villas)	**1210 sq. m.** part of 22.3 has.
Two (2) Staff houses	**434.77 sq. m.** part of 22.3 has.
One (1) Driving range area	**257.94sq. m.** part of 22.3 has.
One (1) Spa, One (1) barbershop, and One (1) salon	**543.54 sq. m.** part of 22.3 has.
Two (2) Range Lawns	**3734 sq. m.** part of 22.3 has.
Four (4) Swimming pools	**380.16 sq. m.** part of 22.3 has.
Five (5) Lagoons	With a total capacity of **7973.65 m^3**

FIGURE 1-12. GENERAL SITE DEVELOPMENT PLAN



1.4.1.1 Golf Course

The proposed Brittannika Golf Course Project is an 18-hole golf course with corresponding amenities such as a clubhouse. The said project will be established on 22.3-hectare land and is will be laid out to adhere to international quality standards, efficient utilization and conservation of natural resources, and environmental safety. Figure 1-7 presents the Site Development Plan for the project as well as the locations of the following project components:

- Tees, greens, bunkers fairways, limits of rough, native planting areas, lakes, and car paths;
- Irrigation system including, but not limited to, sprinkler heads, quick couplers, pipe fittings, wire splices, valves, pump station, and mainline and lateral line routing;
- Property line, clubhouse area, maintenance facility, parking lot, entrance road, and rain shelters and utility easements; and
- Perforated and solid pipe, manholes, catch basins, pipe outlets, overflows, and observation risers including cleanouts for greens, bunkers, and practice area tees

As indicated in Table 1-7, the total projected cut-and-fill volume for the golf holes is 5,734.91 cubic meters. Cut materials will be backfilled to the lower parts of the golf course.

TABLE 1-7. CUT AND FILL SUMMARY

COMPONENT	CUT VOLUME (m^3)	FILL VOLUME (m^3)
SWIMMING POOL		
Swimming Pool 1	110.48	
Swimming Pool 2	110.48	
Swimming Pool 3	269.74	
Swimming Pool 4	269.74	
GOLF HOLES		
HOLE #1		
Tee Mount		129.60
Hole Base		558.00
Sand Trap	255.00	
HOLE #2		
Tee Mount		129.60
Hole Base		143.00
Sand Trap	118.50	
HOLE #3		
Tee Mount		129.60
Hole Base		341.00
Sand Trap	107.45	
HOLE #4		

Tee Mount		129.60
Hole Base		431.35
Sand Trap	163.37	
HOLE #5		
Tee Mount		129.60
Hole Base		298.94
Sand Trap	249.12	
HOLE #6		
Tee Mount		129.60
Hole Base		354.19
Sand Trap	324.62	
HOLE #7		
Tee Mount		129.60
Hole Base		458.17
Sand Trap	166.64	
HOLE #8		
Tee Mount		129.60
Hole Base		317.11
Sand Trap	176.75	
HOLE #9		
Tee Mount		129.60
Hole Base		409.61
Sand Trap	244.64	
HOLE #10		
Tee Mount		129.60
Hole Base		247.52
Sand Trap	175.83	
Lagoon	228.24	
HOLE #11		
Tee Mount		129.60
Hole Base		294.21
Sand Trap	148.44	
HOLE #12		
Tee Mount		129.60
Hole Base		800.55
Sand Trap	211.70	
HOLE #13		
Tee Mount		129.60
Hole Base		1,026.68
Sand Trap	136.04	
HOLE #14		
Tee Mount		129.60
Hole Base		653.98
Sand Trap	186.20	
Lagoon	286.81	

HOLE #15		
Tee Mount		129.60
Hole Base		719.21
Sand Trap	134.48	
Lagoon	302.52	
HOLE #16		
Tee Mount		129.60
Hole Base		623.40
Sand Trap	90.98	
HOLE #17		
Tee Mount		129.60
Hole Base		181.30
Sand Trap	94.31	
Lagoon	196.61	
HOLE #18		
Tee Mount		129.60
Hole Base		541.28
Sand Trap	238.70	
TOTAL	**4,997.39**	**10,732.30**

1.4.1.2 Irrigation Lake/Pond

The project plan provides for the construction of four (4) lagoons (or artificial lakes) for water impoundment within the vicinity of the project area. The design depth for all three lakes is roughly 2.5 meters, as shown in Table 1-8.

TABLE 1-8. DETAILS OF PROPOSED LAKES

DESCRIPITION	SURFACE AREA (m^2)	MAXIMUM ESTIMATED VOLUME (m^3)
Lagoon 1	328.06	705.33
Lagoon 2	760.79	1635.70
Lagoon 3	655.38	1409.07
Lagoon 4	956.04	2055.49
Lagoon 5	1008.40	2168.06
TOTAL	**3708.67**	**7973.65**

The lakes will be used to collect rainwater and as a water obstacle feature on the golf course. Rainwater or surface runoff collected in lakes will act as a backup source of water supply during the dry season and El Niño when water is limited. The lakes will not be used to cultivate or propagate fish for human consumption.

The following designs will be considered in the development of irrigation or artificial lakes:

- Create a safe embankment fill where the present contour level is lower than the lake top level

- Internal slopes that are safe and appropriate.
- Geosynthetic or other suitable materials with a specific thickness will be utilized.
- Establishing the cushion layer on the embankment.
- Overflow weir with piping/pumping system for harvesting water.

1.4.1.3 Cart Path

Cart pathways, maintenance paths, and concrete curbing must be designed in accordance with specifications and drawings that allow for good traffic flow and safe slopes. The Proponent will confer with its golf course expert designer on the ideal locations of cart pathways, maintenance paths, and concrete curbing to provide for golf course aesthetics.

- *Cart Paths* – Minimum of 2.5-meter concrete
- *Maintenance Paths* – Minimum of 3-meter concrete
- *Concrete Curbing* – Installed around the green and tee complexes and as directed to capture runoff water and direct it into catch basins or drainage swales.

1.4.2 Support Facilities

1.4.2.1 Clubhouse

The clubhouse facilities will be 520 square meters (Clubhouse 1) and 706.56 square meters (Clubhouse 2), and will include a multifunctional function space, lounge and bar, locker and shower area, a storage facility for golf equipment and carts, kitchen, administrative, and engineering services. The clubhouse will also have open parking spaces. Figure 1-13 shows the design for the clubhouse facility.

FIGURE 1-13. CLUBHOUSE FACILITY OF THE GOLF COURSE PROJECT

1.4.2.2 Power Supply

The local distribution utility, South Cotabato Electric Cooperative II (SOCOTECO II) will supply the electricity that will power all of the project's facilities and support infrastructures. The aforementioned electric cooperative presently serves two municipalities in the Province of South Cotabato – Tupi and Polomolok, the City of General Santos, and the whole Province of Sarangani.

However, to maintain a consistent supply of power for the golf course project, a stand-by generator with adequate capacity to supply the project will serve as a backup power source in situations of a power outage. Also, a supplementary source of power can be provided by the solar panels installed in the area.

1.4.2.3 Water Supply and Demand

1.4.2.3.1 Water Demand – Construction Phase

During the construction process, water will be necessary for construction works as well as daily laborers' domestic activities such as drinking, washing, and cleaning, as well as other auxiliary needs such as water for plant nursery care and other construction-related uses. Approximately 40,000 cubic meters of water is necessary for the construction of the project.

1.4.2.3.2 Water Demand – Operation Phase

In terms of water consumption during the operation period, the total need for water for domestic and non-domestic (golf course operation and maintenance) uses is projected to peak at around 600 cubic meters per day.

Water to be utilized for domestic purposes can be supplied by the local water district in the municipality. Additional requirements for water used for other purposes can be supplied by groundwater pumps in the project's vicinity.

1.4.2.3.3 Domestic Water Supply

Domestic water will be needed for the day–to–day operation of the Clubhouse and other project support facilities and amenities, notably for washing, cleaning, and other such operations.

It is anticipated that a maximum demand of 30m^3/day can be met during the peak season of operation, particularly during events and competitions with a high influx of tourists and golfers.

1.4.2.3.4 Non – Domestic Water Supply

Non-domestic water supply is required mostly for irrigation and maintenance on the golf course. The peak water need is projected to be about 18,378.13 cubic meters per month. This forecast takes into account the dry months of November through April of each year.

Table 1-9 presents the peak total water requirements for the whole golf course.

TABLE 1-9. PEAK DOMESTIC AND NON-DOMESTIC WATER REQUIREMENTS

PURPOSE	WATER REQUIREMENT	
	CUBIC METERS/DAY	CUBIC METERS/MONTH
DOMESTIC		
Clubhouse (major load during events, conferences, etc.)	30	900
Administrative, engineering, and kitchen areas		
NON-DOMESTIC		
Golf Couse - Irrigation	400	12,000
Landscape - Irrigation	160	4,800
Landscape – Water Features	15	450
Swimming Pool		228.13
TOTAL	**575**	**18378.13**

The required water supply of the project will be sourced from the following possible sources:

- Groundwater source harnessed by use of pumps installed in the vicinity of the project
- Rainwater or runoff water retained in five irrigation ponds/artificial lakes of the golf course

1.4.2.4 Drainage

The project will include the installation of a well-engineered drainage piping system, which will be crucial to the project's operation. During construction, all excavated areas shall be kept smooth and well-drained. All swales and depressions shall be kept in place to provide proper drainage to specified collection sites.

Drainage will be provided by burying a 10 cm perforated drainpipe in a gravel-filled trench. The water that drains through the perforated pipe will be used to irrigate the golf course lake.

1.4.2.5 Soil Erosion and Siltation Management Controls

Soil erosion management measures will be installed before grading and contouring the site to reduce soil exposure. To control soil erosion and sediment movement during grading activities, some measures will be employed, including the building of engineered fills and the installation of erosion mats, rip-rap silt fences, and silt traps.

A siltation pond will be built in key spots to regulate run-off to and from neighboring areas, as well as to add to the course's all-weather features. Drainage patterns throughout the land will naturally serve as the foundation for the project's drainage design.

1.4.2.6 Safety and Emergency Facilities

During the project's operation, safety and emergency facilities, equipment, program, and appropriate workforce augmentation will be operationalized. A specialized health facility, to be placed in the clubhouse area, will be developed to address minor health issues of golfers and staff during emergency circumstances.

More significantly, the company will enhance its preventative measures by creating safety guides, rules, and programs that all golfers, tourists, and corporate workers must follow. Sufficient and effective safety equipment, systems, and personal protective equipment (PPE) will also be installed to guarantee that unfavorable events are addressed and avoided.

1.4.3 Pollution Control Devices and Waste Management System

1.4.3.1 Wastewater Generation

The domestic processes during the operation and maintenance of the clubhouse facility will be the primary source of wastewater. The wastewater discharge from the clubhouse will mostly come from the toilet, kitchen, laundry, and floor cleaning.

All wastewater from these sources will be collected and sent through a network of sewage pipes to the designed chambered septic tank, which will include black and grey water treatment procedures, and will regularly be desludged.

The sewerage system of the clubhouse facility will consider the following:

- Kitchen waste will be linked to a grease trap before its connection to the main sewerage system;
- Access into the sewer system will be provided to allow periodic cleaning; and
- Enough plumbing vents will be installed to allow the release of sewer gases from the sewer system.

For other wastewater generated such as from washing down of vehicles or machinery used on golf courses, e.g., grass cutting machinery or equipment and golf buggies, the project will be utilizing the reed bed technology in the treatment of wastewater.

Wetland processes help remove or convert a variety of water pollutants, including organic (both natural and synthetic) chemicals, metals, nutrients, suspended particles, and sediments.It has the potential to establish a new ecological habitat while also blending in with the golf course's landscape and features. Reed beds need little maintenance and can provide further surface water control.

Reed beds dewater sediments in limited areas by using common reed plants (*Phragmites australis*). To fit existing land conditions and landscape, the beds can have any shape. The reed plants are planted in specially built ponds with underdrains coated in a sand and gravel combination.

Figure 1-14 shows an example of a reed bed used for the treatment of wastewater in golf courses.

FIGURE 1-14. REED BEDS USED FOR WASTEWATER TREATMENT

1.4.3.2 Solid Waste Generation

The project will produce solid waste as a result of the day-to-day operation of amenities, notably the clubhouse, and the upkeep of the golf course area. The solid waste created will be biodegradable, recyclable, and residual from the clubhouse,

as well as agricultural waste generated from the golf course area as a consequence of tree and grass cutting and management.

During the operation phase, solid waste generation is expected to peak at 20 kg/day, based on a high season of 500 project workers, golfers, and guests. The calculation is based on National Solid Waste Management Commission (NSWMC) statistics from 2016, which shows that the average per capita waste creation in both urban and rural areas is 0.40 kg per day.

The Project will adhere to solid waste management standards established by the Ecological Solid Waste Management Act of 2000. The project's solid waste will be separated from the source into biodegradable, recyclable, residual, hazardous, and agricultural wastes. Composting will be used to handle biodegradable and agricultural wastes, as well as other compostable products.

Recyclable material will be collected and managed in the project's Materials Recovery Facility (MRF) before being disposed of or sold to waste-recycling facilities in the province or region. Non-compostable and non-recyclable residual waste materials, on the other hand, will be disposed of in an environmentally friendly manner through a long-term disposal facility such as a sanitary landfill. Before the collection by the local government unit (LGU), residual wastes would be properly handled and stored. The project's residual waste will be disposed of in the sanitary landfills situated within the province.

1.4.3.3 Water pollution and possible toxicity due to the application of fertilizers and pesticides

To minimize environmental water contamination, the following mitigation actions will be implemented:

- To decrease the usage of fertilizers and pesticides, the well-established concepts of Integrated Pest Management (IPM2) will be used.
- Only readily biodegradable insecticides with minimal "persistence/residual impact" would be used if possible.
- The use of fertilizers will be complemented by the use of bio-fertilizers and manures, and their proportions will be regulated by need-based applications based on soil analysis.
- For runoff control, a variety of structures such as dikes, check dams, trenches, grassed rivers, grass swales, roughs, and lakes will be employed. The water kept in man made ponds will be tested for traces and the chemical content of fertilizers and pesticides.
- Fertilizers, pesticides, and hazardous substances will be stored, handled, and disposed of following the standards and regulations of DAO No. 2013-22.

1.4.3.4 Hazardous Materials Storage and Disposal

1.4.3.4.1 Toxic and Hazardous Wastes

A designated storage area for pesticides, fertilizers, and other hazardous materials will be installed and constructed hazardous waste storage will be utilized only for hazardous wastes. Proper labeling and handling shall be done. Any unauthorized person shall not be allowed to enter the storage.

All hazardous waste to be generated will be stored in the Material Recovery Facility (MRF) consistent with the existing rules and regulations under Republic Act No. 6969. The accredited Pollution Control Officer (PCO) will prepare and submit material data sheets and conduct regular monitoring to ensure that all hazardous materials will store in a safe place.

A Self-Monitoring Report (SMR) and online Compliance Monitoring Report (CMR) will be prepared and submit by the accredited PCO to Environmental Management Bureau (EMB) Regional Office and Central Office, respectively.

Disposal of the hazardous wastes materials will be hauled only by DENR-EMB accredited TSD Facilities in compliance with RA 6969.

1.4.3.4.2 Non-Toxic and Non-Hazardous Wastes

The segregation of different wastes according to kind (biodegradable, residual, recyclable, special wastes) will be strictly implemented. The management and operation of the materials recovery facility will be carried out by the assigned personnel. Collection and disposal of segregated solid waste will be coordinated with the barangay and the municipality. Recyclable materials such as plastic, tin cans, papers, and other recyclable materials are collected by accredited haulers only.

Tables 1-10 and 1-11 offer a list of fertilizers and pesticides that the company may use to maintain the turf grasses at the golf course site, accordingly. These fertilizers and pesticides are extensively utilized across the world for a variety of uses, most notably golf courses.

TABLE 1-10. LIST OF FERTILIZERS USED IN GOLF COURSES

FERTILIZER GRADE	RECOMMENDED USE	KG/HECTARE OF PRODUCT PER APPLICATION
Slow Release Fertilizers		
19-3-19 (rough grade)	0.25 – 1.0 LBN/1000 ft^2	136 kg – 272 kg
19-3-19 (greens grade)	0.50 – 1.0 LBN/1000 ft^2	20 kg – 40 kg
18-3-18 (greens grade)	0.50 – 1.0 LBN/1000 ft^2	18 kg –36 kg
14-0-28 (greens grade)	0.50 – 1.0 LBN/1000 lft^2	30 kg – 60 kg
23-5-10 (rough grade)	1.0 –2.0 LBN/1000 ft^2	37 kg –74 kg
22-5-5 (rough grade)	0.75 – 2.0 LBN/1000 ft^2	27 kg – 72 kg
Quick Release Fertilizers		
46-0-0	0.25 – 1.0 LBN/1000 ft^2	28kg-112kg
21-0-0-245	0.25 – 1.0 LBN/1000 ft^2	61kg-224kg

FERTILIZER GRADE	RECOMMENDED USE	KG/HECTARE OF PRODUCT PER APPLICATION
14-14-14	0.25 – 1.0 LBN/1000 ft^2	92kg-363kg
Others		
Step (Micronutrient Fertilizer)	39 LBS-60 LBS products/acre	33.6 kg –67.3 kg
Sulfur	50-LBS-100LBS	56kg – 112 kg

TABLE 1-11. LIST OF PESTICIDES USED IN GOLF COURSES

CHEMICAL/BRAND NAME	ACTIVE INGREDIENT	RECOMMENDED RATE OF USE
Herbicide		
Basagran	Bentazon 480 g/L	320 ml/161 or (2.6 oz/gal)
Round-up	Glyphosate, 430 g/L	320 ml/161 or (2.6 oz/gal) 2%
Agroxone	4-chloro-2-methylphenoxy acetic acid (MCPA) 400g/L	170 ml/161 or 14 oz/gal
Shell 2,4-D Ester	2,4-D Isobutyl Ester 400g/L	6.6 ml/161 or 0.05 oz/gal
2,4-D Granules	Bentazon 480 g/L	20 kg/ha
Ronstar	Oxadiaxon, 250 g/L	Experimental Recommended
MSMA (Bucno 6)	Monosodium Acid Methane Arsenate	115 ml/151 or 1 oz/gal
Image	Ammonium Salt of Imazaqiun	60 ml/161 or 0.5 oz/gal
Manage	Methyl 5-[((4,6-dimethoxy-2-pyrimidinyl)amino) carbonylaminosulfonyl)-3-chloro-1-methyl-1H-pyrazole-4-carboxylate, 75%	3.6gm/161 or 0.03 oz/gal
Fungicide		
DACONIL 2787	Chlorothalonil, 750 g/kg	Preventive 3 oz/1000ft^2 Curative 5 oz/1000ft^2
Manzata 200	Mancozeb, 80% (800 g/kg	38 kg/ha or 6 oz/1000 ft^2
Insecticide		
Lorsban 3E	Chlorpyrifos, 30%	3 oz/1000 ft^2or 10 L/ha
Sevin 85 WP	Carbonate, 85%	0.1702 – 1.36 oz/1000 ft^2
Disinfectant and Filter (For Swimming pool)		
Calcined Diatomaceous Earth	Silica, 100%	
Nisso Hi-chlon 70 Granular	70% calcium hypochlorite $Ca(ClO)_2$	2.8 grams per 500 gallons of pool water

The storage requirements for fertilizers and pesticides that may be used for the project, as shown in Tables 1-8 and 1-9, respectively, as well as other hazardous materials and substances that may be used in the golf course operation, will be in conformance with Republic Act No. 6969, also known as the "Toxic, Substances, Hazardous, and Nuclear Waste Control Act of 1999" and Chapter 6 of DENR Administrative Order No. 2013-22, "Revised Procedures and Standards for the Management of Hazardous Wastes". In addition, the proponent will follow the regulations of the Department of Agriculture – Fertilizer and Pesticide Authority (FPA), notably those pertaining to the correct use and storage of fertilizers and pesticides.

Hazardous substances and/or waste will be handled in accordance with the following guidelines:

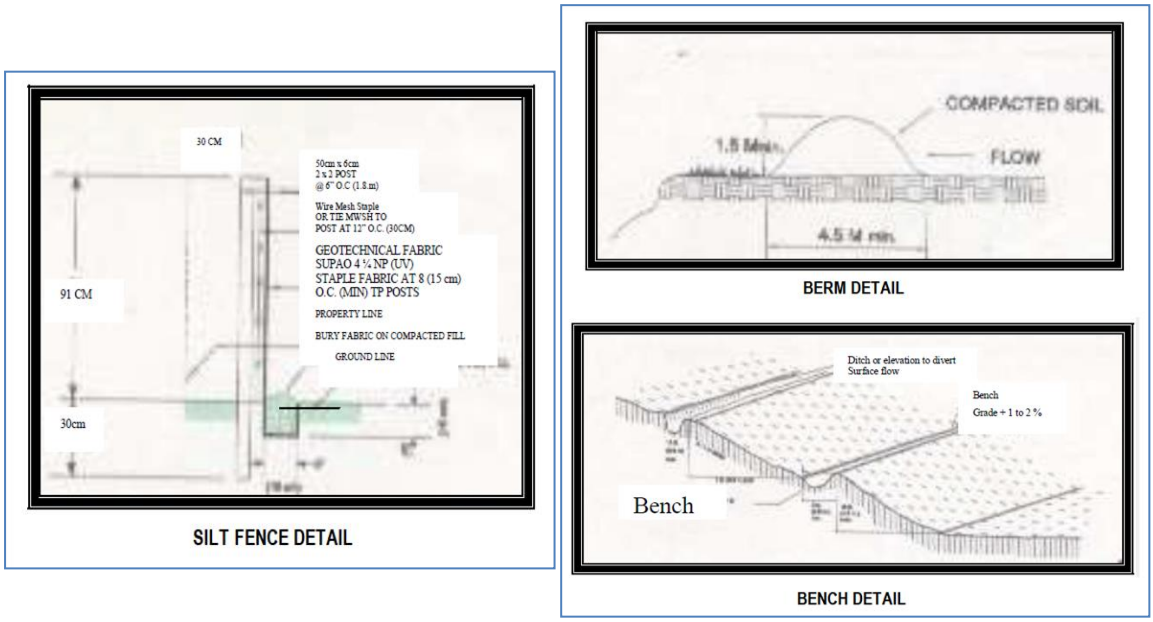
a. Accessible in an emergency and for inspection and monitoring purposes. Must have comprehensive emergency response equipment appropriate to the type of waste being kept and any potential emergencies related to it.
b. Enclosed and well-ventilated
c. Provision of secondary containment that are:
    i. impenetrable to liquids
    ii. resistant to chemicals
    iii. not slippery
    iv. capable of retaining spills
d. Secured and only authorized persons have access to it
e. Have provision for effective waste segregation based on chemical properties and classification of waste
f. Must adhere to the maximum storage limitations established by DAO No. 2013-22 or its revised version.
g. The labeling and packaging standards must be met.

1.4.3.5 Soil Erosion and Siltation Management Controls

Typical soil erosion control structures are presented in Figure 1-15. Prior to grading and shaping the site, soil erosion control features should be installed to minimize soil exposure. A variety of methods shall be used to contain soil erosion and sediment movement during grading activities, such as the construction of engineered fills, installation of erosion mats, rip-rap silt fences, and silt traps.

Siltation pond shall be installed to strategic locations to control run-off, to and from adjacent areas, and also contribute to all-weather characteristics of the course. Drainage patterns throughout the property naturally will serve as the basis for the drainage plan of the Project. Minimal siltation will be encountered as the project is just a renovation of the existing golf course.

FIGURE 1-15. COMMON SOIL EROSION CONTROL STRUCTURES



1.5 Process/ Technology

As with any project, the chronological sequences of the project phases are pre-construction, construction, operation, and abandonment. However, in a golf course project, only the first three phases are generally involved. A world-class golf course, once operational, is not expected to be abandoned except in the event of a major natural catastrophe or a major financial crisis. Nevertheless, if such abandonment becomes, necessary, the golf course can be easily converted into any number of uses.

At present, the project is almost 90% finished as the structures and facilities mostly located at the backside of the area are not yet completed.

1.5.1 Description of Waste Management Systems/ Sewage Treatment

The project's main sources of sewage/effluent will come from toilets, kitchens, and laundry facilities, as well as cleaning and gardening operations. All wastewater from these origins and processes will be collected and sent through a network of sewerage pipes and manholes to the planned sewage treatment plant, such as septic tanks or chambers.

The manholes will allow access to the sewage for routine maintenance, monitoring, and cleaning. To prevent the build-up of sulfur dioxide and hydrogen sulfide, the septic tanks will be well ventilated.

The following design considerations will be applied to the sewage system planned for the project:

- Sewage must be appropriately discharged to a channelized pipe system that leads directly to a treatment facility.
- Before being linked to the sewage system, kitchen waste will be routed through a grease trap.

1.5.2 Description of the Operation and Maintenance of Facility

The Brittannika Golf Course, Inc. will handle the operation and upkeep of the 18-hole golf course, and the superintendent will supervise the administration of fertilizers and pesticides.

1.5.2.1 Turf Grass Maintenance

Fertilizers must be applied regularly. The only fertilizers that should be used are those that have been approved by the Fertilizer and Pesticide Authority (FPA). Soil samples will be collected and analyzed in the laboratory before fertilizer application.

1.5.2.2. Pesticide Management

Weeds will be eradicated manually as often as practicable. Although hand plucking takes time and effort, it ensures complete weed eradication and avoids the use of chemical pesticides. To preserve grass quality, pesticide treatment must be planned by a professional agronomist.

Only Fertilizer and Pesticide Authority (FPA) – certified formulations of pesticides shall be utilized. All chemical containers shall be appropriately labeled and disposed of in accordance with Republic Act 6969.

Pesticides help to limit the damage that can be caused by insects, weeds, and plant diseases. Insecticides, herbicides, and fungicides are used very selectively to protect the health of the turf, trees, and other living things on the course. Fertilizers provide much-needed nutrition for the course's plant life. It is very important to note that pesticides and fertilizers are not used primarily for aesthetic reasons. First, they are tools that help ensure a healthy playing surface for the game. Furthermore, they help to protect a valuable and ecologically important piece of land. For example, golf courses help to filter air pollutants and create fresh oxygen, they are excellent groundwater recharge sites and, most importantly, they are critical wildlife sanctuaries in urban and suburban areas.

FIGURE 1-16. STAINLESS KNAPSACK SPRAYER (*Tung Ho SA-16 Golden Agin)* USED IN THE APPLICATION OF PESTICIDES

A record of pesticide application (type of chemicals, frequency of application, dosage, etc.) will be kept for future reference. The chemicals to be used in the golf course maintenance will be handled and stored according to the prescribed procedures stated in the Material Safety Data Sheet (MSDS). Protective measures on handling and storage will also be adapted during the operation. If necessary, a resident agronomist or a safety officer will be assigned to enforce the proper handling and storage of pesticides, herbicides, and fertilizers.

1.5.2.3 Aeration

The course will be aerated by motorized aeration equipment once the grass has been developed. Aeration is a technique that involves punching holes in the turf to enable moisture, oxygen, and nutrients to permeate the soil. It removes thatch, which impedes water absorption, and the ground is leveled using a rake.

FIGURE 1-17. GOLF COURSE AERATION

1.5.2.4 Mowing

The project will be suitably equipped with mowing equipment that is state-of-the-art and will be managed by experienced staff. Their job is to keep the vegetation under control.

1.6 Project Size

The planned Brittannika Golf Course Project is an 18-hole golf course located on a 22.3-hectare property covered by five (5) land titles - Transfer Certificate of Titles (TCT) Nos. 145-2016003696, 145-2016003697, and 145-2016003698, Original Certificate of Titles P-25653 and P-16912, and all of which are registered under and owned by Brittannika Golf Course, Inc.

1.7 Development Plan, Description of Project Phases, and Corresponding Timeframes

The phases of project development and the time for each activity are listed in Table 1-10. The project has started its construction and is proposed to be completed by the year 2022.

TABLE 1-12. PROJECT TIME FRAME

YEAR	Activities
2018	Construction of the Project
2019	Expansion of the Project (Guesthouse Villas)
2021	Construction of other components
2022	Full construction of the remaining component
2023	Full operation of the Project

1.7.1 Pre-Construction Phase

At this point, the developer collaborates closely with the golf course architect to make a final choice on the project's design. Based on the specific design, the developer's engineers assess and modify the project costs and timeline, which includes finding critical locations such as centerlines and golf course borders. To add further improvements to the golf course, slight alterations in the field were carried out by blending in the natural terrain and conserving the present features of the environment.

Initially, the project proponent acquires all the requirements needed from relevant government agencies. Then, construction equipment and supplies are transported and mobilized to the site. For smooth implementation and construction operation, the hiring of essential personnel such as a golf course superintendent is necessary. Residents can then be hired for labor, carpentry, and masonry works when the construction phase of the project commences.

The final stage of the pre-construction phase will be the clearing of the golf course area and the start of excavation for the reshaping of the landscape. In order to minimize the unwarranted removal or destruction of the prevailing features of the area that will be integrated into the landscape, the process will be executed into parts of stages. Existing trees and important vegetation will be preserved as much as

possible, however, if there is a need, they will be relocated later on to make way for changes in the landscape. Then, the topsoil will be thoroughly transferred into a selected area to make way for grading activities after the clearing of the golf hole areas.

1.7.2 Construction Phase

1.7.2.1 Grading and Shaping

The golf course will require grading in order to achieve proper and sufficient drainage as part of the design features. Bulk shaping will first be employed in the project site to rough grade the initial landscape and finalize all primary earthworks for the golf hole features like tees, greens, and bunkers. The slopes around the golf hole features will be at a 5:1 ratio or less, while in fairways, roughs and other non-use areas will have slopes not greater than 3:1.

The existing natural landscape of the area will be maintained to the greatest extent during the grading activities. For the golf holes, the cumulative cut-and-fill volume amounts to 5,734.91 cubic meters.

Drainage pipe and irrigation line installation will follow after the bulk shaping of the area. As much as possible, natural drainage swales will be utilized, but if specific areas cannot be drained properly, a 10-cm perforated drainage pipe will be installed and embedded in a trench filled with gravel. The accumulated water from these pipes will be drained into the artificial ponds and can be used for the irrigation of the golf course.

After these preliminary grading and shaping processes, the golf holes will be fine-shaped to finalize each unique topography and shape of the whole course. Then, topsoil and greens will be covered in applicable areas.

1.7.2.2 Development of Course Drainage

Drain channels will be excavated in a herringbone or semi-herringbone pattern, with the water traveling no more than 6 meters to reach a tile drain. Trenches must be at least 20 cm wide and 30 cm deep, with a continuous gradient of not less than 0.5 percent slope at the bottom. Washed gravel with a diameter of 9.5 to 6.4 mm will be uniformly scattered 7 cm deep at the bottom of all trenches. The perforated drain pipe will be installed on top of the gravel layer. The drainpipe, which will be 10 cm in diameter, will be made of plastic. Impervious sleeves must be used to connect all pipe junctions. The trenches will then be filled with ten centimeters of gravel. The drain tile will be connected to one or more conduit pipes that will exit the green at its lowest position. The conduit pipes will then reach lakes, streams, and other non-play areas.

1.7.2.3 Development of Irrigation Water Supply

For the whole golf course, one irrigation lake with a depth of around 2.5 meters will be built. The irrigation facilities' total storage capacity is estimated to be 15,000 cubic meters, which is just enough for a half-month supply during the dry months.

To reduce seepage that might lead to groundwater pollution, the lake bottom will be sealed by compression of the foundation material and installation of non-permeable sheet material such as high-density polyethylene (HDPE) liner.

A weather detecting, a computer-controlled irrigation system that will dispense water only when the sensors detect regions with dry soil conditions will be installed to optimize the usage of water for irrigation.

1.7.2.4 Grassing and Landscaping

Following the construction of irrigation and drainage systems, the affected areas will be prepared and planned with the required turf grass types, for example, *Paspalum* for the fairways, Tiff 419 Bermuda grass for the rough area, and CL 2000 for the greens.

Planting will be done in areas that are prone to erosion for added protection. All turf grass areas will be fertilized using the appropriate fertilizer mixes. The first line of defense against turfgrass disease will be to achieve "soil balance" during the grow-in phase. This means less fertilizer and pesticides will be used during the maintenance period. The greens, which will be fumigated before grassing to provide ideal circumstances for turfgrass growth, will be the most heavily frequented parts of the course. To achieve the required aesthetic quality, the golf course will also be planted with trees, bushes, and other plant materials.

1.7.2.5 Construction of Infrastructures

The accompanying golf course infrastructure (e.g., golf perimeter fence, concrete walkways, clubhouse, etc.) will be built in tandem with the golf course, using the same construction processes and health and safety standards. There will be a 2.5-meter wide cart pathway to be constructed.

The construction phase of the clubhouse and dormitory involves the following activities:

1. Mobilization of personnel and equipment;
2. Site clearing and grubbing;
3. Site grading, slope stabilization, and compaction;
4. Road, perimeter fence, and entrance gate construction;
5. Storm drainage and house sewerage construction;
6. Construction of water distribution system; and
7. Installation of the electrical system

The major activities involved in the construction of the clubhouse and dormitory are described sequentially in the following sections.

1.7.2.5.1 Mobilization of Personnel and Equipment

At this stage, the Proponent mobilized its personnel and needed construction equipment for the project. During mobilization, temporary housing and sanitary facilities were installed by the Proponent at the project site for its project personnel and laborers. The old building/clubhouse is being utilized as a temporary admin office.

The temporary housing and sanitary facilities were dismantled and demolished after the completion of the golf course and dormitory but the old building is still being utilized as an Admin office. For access to the project site, the existing concrete road is utilized.

1.7.2.5.2 Site Clearing and Grubbing

The activities undertaken by the Project Proponent during the construction phase of the project include site clearing; grubbing, removal of shrubs, plants, and other unnecessary vegetation and scrap materials at the project area, and preservation of trees as much as possible. The cutting of vegetation (particularly trees) shall be supported with a tree cutting permit from DENR.

1.7.2.5.3 Site Grading, Slope Stabilization, and Compaction

Site grading, slope stabilization, and compaction were simultaneously initiated with site clearing and grubbing, as much as possible long exposure of earthen materials was avoided during the construction/renovation phase of the project. The construction activity includes site grading, cut and fill, compaction, project layouting, checking of all lines, elevations, dimensions, etc. Site grading was done in such a way that the volumes of cut and fill are balanced to minimize borrow materials.

1.7.2.5.4 Road, Perimeter Fence and Entrance Gate Construction

When the site grading, slope stabilization, and compaction activity will be 90% finished, the proponent started to construct the road, perimeter, and entrance gate of the project. The entrance road has an average of 5 meters wide, the car path has an average of 1.5 meters width, and the perimeter fence of 2 meters in height. The concrete road has a 21 Mpa compressive strength. Concrete hollow blocks are used for the construction of perimeter fences with solid concrete foundations and with appropriate diameter steel bars.

1.7.2.5.5 Storm Drainage and House Sewerage Construction

A combined drainage system (from herringbone to lateral drainage and stormwater drainage) was applied to the golf course. Generated sewage from the clubhouse septic tank goes to a sewer system towards the Sewage Treatment Plant (STP).

After site grading, slope stabilization, and compaction activity, the construction and installation of the storm drainage system and sewerage system include the installation of the Sewage Treatment Plant (STP) facility. Drainage and sewerage pipe laying and backfilling and concreting were started together with the construction of the electrical system, water system, and road laying and construction. The storm drainage system is an underground drainage system using concrete catch basins and

manholes and reinforced concrete pipes of various diameters. The sewerage system is of underground drainage system using single and double sewerage drainpipes and various types of plumbing materials.

Stormwater and runoff will be collected by the drainage system, which consists of concrete catch basins and manholes, and concrete pipes. Runoff at the project site will drain to the golf lagoon for impoundment and stabilization to be utilized for golf irrigation. The lake bed and sides shall be covered by high-density polyethylene (HDPE).

1.7.2.5.6 Construction of Water Distribution System

The construction of the water supply system started together with the construction and installation of a domestic water supply distribution system include trenching, water supply pipe laying, and backfilling. The domestic water supply is made of cast iron pipes and fittings for main water lines. The source of water is supplied by the water district. A water tank with a 4,000-gallon capacity was installed to serve as water storage to supply the water consumption of the project.

1.7.2.5.7 Installation of the Electrical System

After the installation of the domestic water supply distribution system, the installation of the electrical system was started. The installation of the electrical system includes the construction of the concrete electric posts, main electric centers, streets lights, primary and secondary electrical lines. The electrical system required for the project was coordinated with the proper authority concerned.

During construction, the following were given considerations:

- The construction materials used for the project were strictly in accordance with the codes, standards, and specifications acceptable in the Philippines such as those set by the American Concrete Institute (ACI), American Welding Society (AWS), and the American Society for Testing and Materials (ASTM). Construction materials include cement, rock/sand aggregates, masonry, steel/iron bars, lumber, galvanized iron, glass, tiles, etc.
- The utilization of construction machinery including a bulldozer, loaders, dump trucks, rollers, water trucks, graders, and other materials handling vehicles.
- The proponent strictly followed the designs and specifications as prepared by the project architects/engineers in accordance with various provisions of the Building Code of the Philippines (P.D. 1096). The various infrastructures have been designed with due considerations.
- Estimated designed loading, bending deflection, and earthquake occurrence were thoroughly considered to ensure its soundness and safety. All foundation

works conform to the prescribed mix and curing period and the structure is provided with the appropriate diameter of reinforcing bars.

- For environmental enhancement, proper mitigating measures to avoid siltation along the nearby river/creek were implemented. Appropriate easement/setback at the edges of the water body/creek was applied/enforced by the proponent as a standard construction design.
- The proponent likewise followed and enforced all safety measures to prevent/minimize accidents and injuries to the construction workers. These include the compulsory wearing of hard hats, goggles, gloves, and the general observance of safe construction practices.

The following section shows the description of the activities comprising the construction phase:

- Mechanized equipment used in the entirety of the construction phase, except in the finishing stage, are the following:
    1. Air compressors
    2. Concrete vibrators
    3. Bulldozers
    4. Cement mixers, etc.
- Construction materials such as cement, sand and gravel, steel frames, etc. were purchased locally.
- Before the completion of construction, the maintenance and management of the golf and clubhouse begun. During the grow-in period, responsible management practices were done and the golf course was prepared for opening. A playability test was conducted to gain feedback on the characteristic feel and playability of the course. The recruitment process for operations managers, staff, and contractual workers was initiated. Preference was to qualified residents. Training programs were also implemented to ensure high-quality service at all times. After establishing the turfgrass and the maintenance has achieved on the desired level, the golf course was opened for play.

1.7.2.6 Pre-operational Activities

Prior to the conclusion of construction, the golf club's maintenance and management will commence. Responsible management practices will be implemented throughout the grow-in period, and the golf course will be ready for opening. A playability test will be done to get comments on the course's unique feel and playability. The hiring of operations managers, personnel, and contract workers will proceed. Qualified

residents who reside in the vicinity will be given priority. Training programs will also be established to maintain consistent high-quality service. The golf course will be open for play after the turfgrass has been planted and the necessary degree of care has been reached.

1.7.3 Operational Phase

The Brittannika Golf Course, Inc. will oversee the administration and upkeep of the 18-hole golf course and clubhouse. Maintenance operations to be performed during the operation stage include fertilizer application, pesticide control, aeration, and mowing. The golf course superintendent will be in charge of the supervision of fertilizer and pesticide applications.

1.7.3.1 Turf Grass Maintenance

Fertilizer formulas are selected based on the soil's particular requirements. For instance, soils deficient in phosphorus – a nutrient required for root growth – will utilize agricultural grade fertilizers (quick release). Controlled-release fertilizer will be used to reduce the possibility of nitrate contamination of groundwater. Slow-release fertilizers are full fertilizer pellets covered with permeable material. When the coating is moistened, a small amount of nutrients seep through until the encapsulated fertilizer is depleted. These items have a shelf life of 3 to 8 months.

The following are the equipment used in the application of fertilizers, as shown in Figure 1-17:

- One (1) Earthway EV-N-SPRED Flex Select Broadcast Spreader; and
- One (1) Multi Pro 5800-D Turf Sprayer with ExcelaRate Spray System.

FIGURE 1-18. EQUIPMENT USED IN THE APPLICATION OF FERTILIZERS

Name: Fertilizer Spreader Toro Earthway Spreader Broadcast Spreader (Walk-behind)

Capacity: 80lbs

Name: Dedicated Sprayer Multi Pro 5800–D Turf Sprayer with Excelarate Spray System

Capacity: 300 gal

Use for: Liquid Fertilizers

1.7.3.2 Water Requirement

Irrigation Water

Water requirement for irrigation for both the golf course and the landscape features is estimated to peak around 16,800 m^3/month depending on the season. On an El Niño year where the dry months are from November to April, the monthly water requirement may increase to more than 20,000 m^3. The resources of water for the project are incident rainfall and spring draining to the lagoons and treated wastewater from the project's STP.

Water harvesting is resorted to as much as possible through the construction of lined artificial lakes for the irrigation of the golf course. Reuse of treated wastewater for irrigation will be employed.

Domestic Water Requirement

The facilities of the project that require domestic water are the clubhouse and admin building. It is estimated to require up to 100m^3/day of water for its full operation and will be supplied primarily by the municipal water system and a portion will be supplied by the groundwater source in the golf course site.

1.7.3.3 Pesticide Management

The application of pesticides, as overseen by the golf course superintendent, is necessary to maintain grass quality. To minimize the risk of soil and groundwater contamination, only formulations certified by the Fertilizer and Pesticide Authority

(FPA) of the Department of Agriculture (DA) will be used and according to the guidelines set.

Options on what pesticides to use should be based on one or all of the hazard classifications recommended by the World Health Organization (WHO) of 1986, Hazard and Guidelines to Classification, 1986-1987, Geneva, Switzerland, and Handbook on the Use of Pesticides in Asia-Pacific region, Asian Development Bank (ADB), 1987. The effective frequency of application as well as dosages of the selected pesticides will be kept to a minimum. An effective minimum concentration can reduce the population of a pest to a non-nuisance or tolerable level.

The Integrated Pest Management (IPM) system will always be implemented. The Golf Course Superintendents Association of America (GCSAA) principles describe IPM as a series of steps as follows:

- Identifying the pest problem (whether weeds, disease, or insects) is important since different pests require different chemical treatments and application methods. This includes analysis of the conditions that cause the occurrence of pests and the determination of the damage threshold level below which the pest can be controlled or tolerated.
- Device ways to change conditions to prevent or discourage the recurrence of the problem.
- The schedule of pesticide application should be based on the life cycle of the pest. Hence, some ecological studies on the population dynamics of the more troublesome pests may be worth pursuing.
- Through time, the repeated use of a specific pesticide against a specific pest may develop tolerance or even evolve a new species among the population which are resistant to the chemical. This may require the use of different pesticides against the same pest at different periods. Therefore, it may be a prudent decision to vary the active ingredient of the pesticide to be used against a particular pest species over time.
- Development of a mowing regime. Mowing at the right time can also fight pests and diseases and can also protect the fragile crowns from exposure.
- The selection of control strategies to suppress the problem with minimal residual impact on the environment.
- Development of alternative non-chemical methods of pest control. Control measures should include biological and mechanical methods apart from chemical means. Biological control involves the use of natural predators or parasites against pests. The use of introduced species should be scientifically screened and tested so as not to cause other types of ecological problems. Mechanical methods make use of traps, physical removal, or pinpoint application of pesticides to eliminate pests. This often requires more human effort, but with the

presence of available workers, this method may well be considered in any pest control situation.

1.7.3.4 Maintenance of Trees and Ornaments (Climate Change Adaptation)

Planted trees and ornaments used for beautification of the golf course serve as a new habitat for migrant birds. Trees and ornaments planted at the project site help clean the air by absorbing the carbon dioxide and other air pollutants emitted by the nearby industrial establishments and by motor vehicles passing through the adjacent road. By absorbing the air pollutants, will purify the air and will help protect against the depletion of the ozone layers that cause global warming and climate change.

1.7.4 Decommissioning and Abandonment Phase

The next sections outline the actions to be carried out after the construction activities have been completed.

The project, on the other hand, is intended to last for a very long time. This development necessitates comprehensive maintenance and close monitoring to meet its requirements and attain its targeted lifespan.

If somehow the project is to be abandoned for whatever reason, the appropriate authorities and involved agencies must be notified 30 days in advance. The abandonment will adhere to established regulations and procedures and will include the execution of rehabilitation/restoration efforts to make the areas as close to their baseline state as possible. The area must be rendered safe and free of hazardous substances in accordance with DENR regulations.

1.7.4.1 Plans for Removal or Disposition of Temporary Structures and Facilities

Once the project is done, all temporary facilities built during the construction period must be demolished or removed from the project site.

1.7.4.2 Plans for Abandoning Temporary Roads

The provisional access road from the current road to the construction area that will be built during the construction phase of the project will subsequently be paved and used for the completed project's road network, so there will be little if any, abandonment.

1.7.4.3 Relocation and/or Termination Plans for Project Facilities

After the project is completed, all heavy equipment utilized during the construction period will be withdrawn. Except for the project contractor's permanent staff, all hired workers will be dismissed or moved to other projects within the company.

1.8 Manpower

1.8.1 Manpower requirement

During the construction phase, 100 skilled and unskilled workers will be recruited, and 50 workers will be employed during the operating phase.

The project will require a certain number of workers for the pre-construction, construction, and operational activities. Table 1-13 shows the estimated number of workers from different phases of the project. Manpower was sourced locally. Qualified local residents were given priority.

In the operation stage of the project, it is estimated that almost 90% of the employees/workers will be local residents and the rest will come from the neighboring municipality.

Poster and streamers will be posted in the Municipal Hall and Barangay Halls once the project will be needing additional workers. Proper coordination with the Department of Labor and Employment (DOLE) will be conducted to ensure compliance of the owner to existing rules and regulations.

TABLE 1-13. MANPOWER REQUIREMENT FOR CONSTRUCTION PHASE

Project Phase	Expertise/Skills	Requirement per Expertise/Skill	Total Requirements per Project Phase
Pre-Construction	Office Staff	College Graduate	3
	Project Designer	Golf Course Designer Company	1
	Project Engineer	Golf Expert/Engineer	1
	Liaison Officer	Good communication skills	1
	Driver	Driving	1
	Consultants	Environment, Business, Marketing, Permitting	5
	Sub-total		***12***
Construction	Survey	Geodetic Engineer	1
	Survey Assistance	Technical, Line Man	2
	Earthmoving	Heavy Equipment Operator	2
	Shaping and Landscaping	Plant Technician	5
		Landscaper	10
		Helper	5
	Civil Works	Civil Engineer	2
		Foreman	2
		Mason	7
		Electrician	3
		Plumber	8

Project Phase	Expertise/Skills	Requirement per Expertise/Skill	Total Requirements per Project Phase
		Painter	3
		Expert Finisher	5
	Material Processing	Warehouse Men	3
	Lake Liner	Plumber, skilled worker	20
	Irrigation	Plumber	17
	Office Admin	Business Course, College Graduate	5
		Sub-total	***100***
Operation	Golf Course Maintenance	Golf Super Intendent/Technician	2
		Helper	5
	Clubhouse Maintenance	Janitor/Utility	5
	Clubhouse Operation	Chef	2
		Kitchen Staff	5
		Waiters/Waitress	3
		Bartender	1
		Manager	1
	Front Desk	College Graduate	2
		Caddies	19
	Security	Security Guard	5
		Sub-total	***50***
		GRAND TOTAL	**162**

1.8 Scheme for Sourcing Locally from Host and Neighboring LGUs

The proponent will prioritize employing locals whose capabilities and experience meet the project's specific requirements. In close collaboration with the involved barangay local government unit (BLGU), a local hiring system would be developed. In general, the proponent would give the concerned BLGU a list of expected employment requirements and related qualifications. The BLGU under jurisdiction will advertise these potential opportunities, and potential applicants will be submitted to the proponent for further assessment and evaluation by the Human Resources office.

To complete a system for recruiting residents from host communities, consultations with LGUs and local communities would be held. Local residents who are qualified will be given first preference in employment. If technical roles are not available in the host

towns, the proponent reserves the right to seek people elsewhere. Compensation conditions and the recruitment procedure shall be in accordance with existing labor laws, rules, and regulations.

Currently, there are no indigenous groups or individuals present in the project area.

1.9 Indicative Project Cost

The projected cost for Brittannika Golf Course Project amounts to Php 150,000,000.00

2. ASSESSMENT OF ENVIRONMENTAL IMPACTS

2.1 Land

2.1.1 Land Use and Classification

2.1.1.1 Geographical Location

Tupi is located in the northeastern part of South Cotabato. It is 24 kilometers away from Koronadal City, the regional seat of Region 12; and 37 kilometers from General Santos City, the Tuna Capital of the Philippines.

It is one of the municipalities in the so-called lower valley of South Cotabato. It is among the three municipalities included within the coverage of the First Congressional District of South Cotabato. With the latest regional modifications, Tupi is now within the jurisdiction of South Central Mindanao or Region 12.

2.1.1.2 Political Boundaries

The municipality is situated between six municipalities of South Cotabato and Sarangani Provinces; Polomolok in the Southeast, T'boli in the south, Banga in the west, Koronadal in the northeastern portion, Tampakan in the north side and Malungon of Sarangani Province in the East.

The total land area of Tupi is 31,150 hectares. The municipality has 15 barangays. Barangay Kablon occupies the biggest land area of the municipality with 4,700 hectares. Barangay Tubeng, meanwhile, occupies a mere 1.83% of the municipality's land area.

FIGURE 2-1. MAP OF SOUTH COTABATO

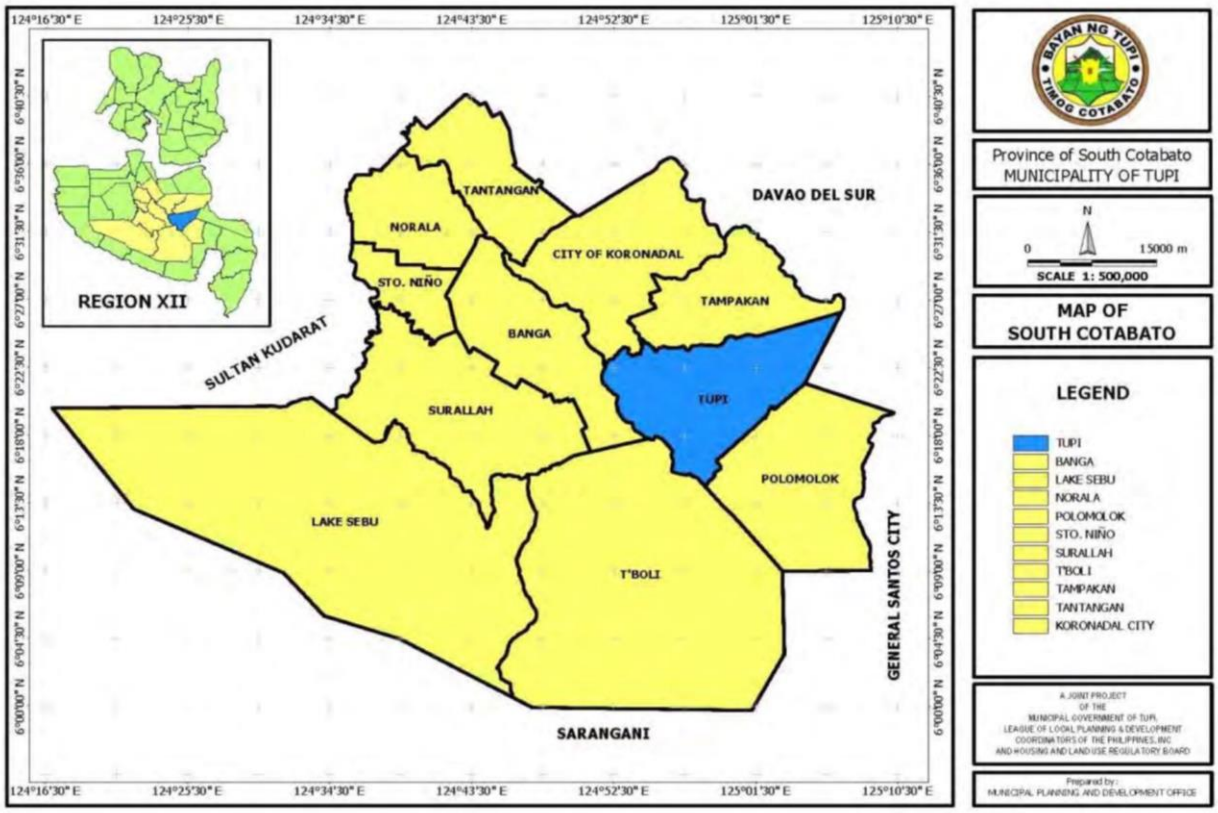


FIGURE 2-2. BARANGAY MAP OF TUPI

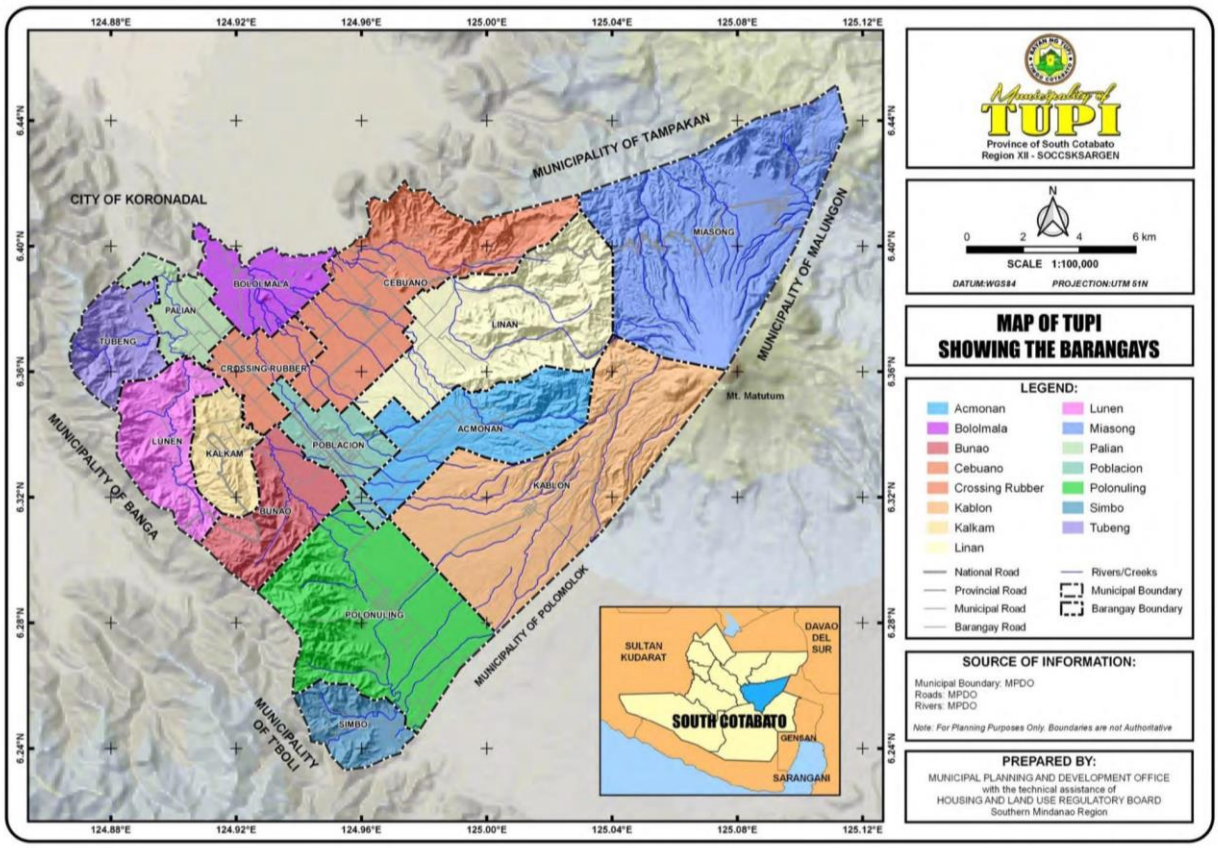


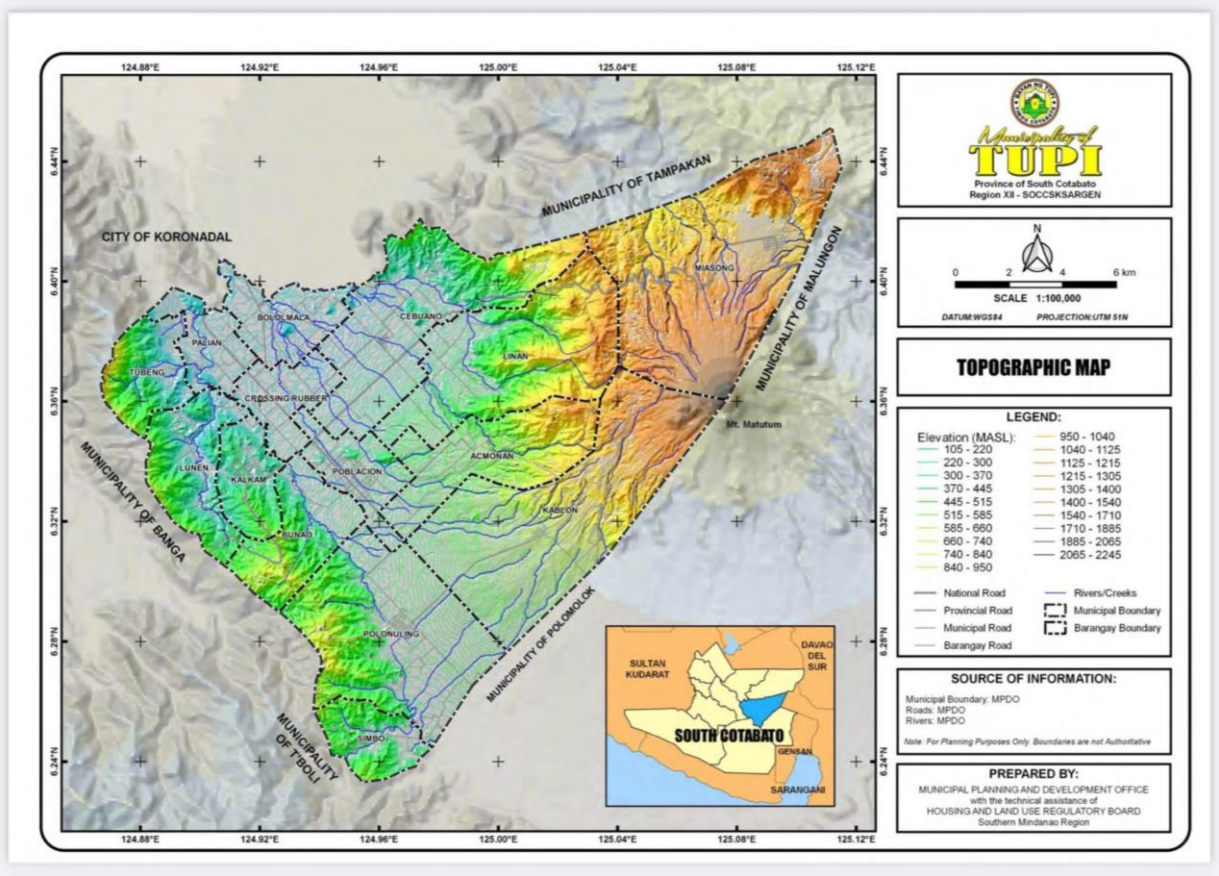
TABLE 2-1. LAND AREA OF EACH BARANGAY

BARANGAY	*LAND AREA (in hectares)*	*% TOTAL LAND AREA*
Acmonan	3,800	12.2
Bololmala	1,000	3.21
Bunao	1,400	4.5
Cebuano	3,500	11.24
Crossing Rubber	800	2.57
Kablon	4,700	15.09
Kalkam	1,200	3.85
Linan	3,200	10.27
Lunen	1,150	3.69
Miasong	3,700	11.88
Palian	1,029	3.30
Poblacion	700	2.25
Polonuling	3,200	10.27
Simbo	1,200	3.85
Tubeng	571	1.83
TOTAL	**31,150**	**100.0**

2.1.1.3 Topography

The municipality is bordered by two mountain ranges, the Quezon Range in the Northeastern portion where Mt. Matutum was located and the Roxas Mountain range in the Southwestern portion. Barangays, within the vicinity of these ranges, have been classified by the Municipality as Upland Areas.

FIGURE 2-3. TOPOGRAPHIC MAP OF TUPI, SOUTH COTABATO



2.1.1.4 Existing General Land Use

By 2006, Global Positioning System of GPS devices were used extensively in mapping activities. Based on the provincial record, the municipality's total land area (around 31,150 hectares) comprises to about 7% in relation to the province's 3,705.89 square kilometer of land.

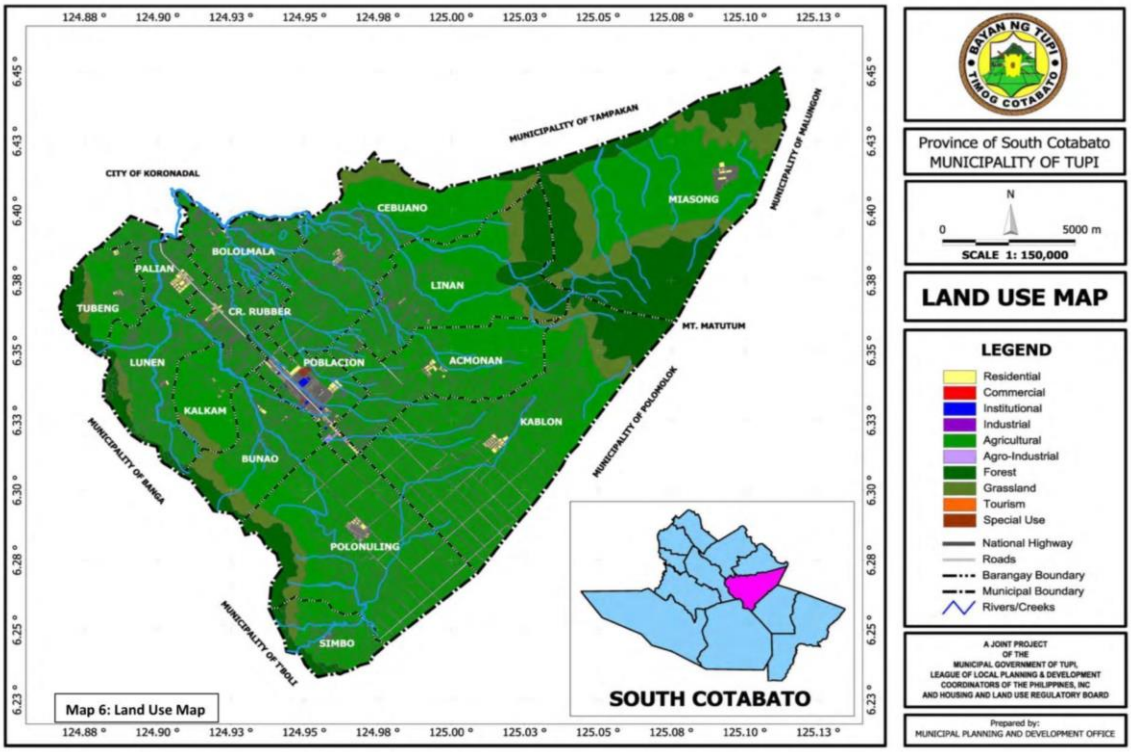
Table 2-2 indicates the existing land uses of the municipality.

TABLE 2-2 LAND USE CATEGORIES IN THE MUNICIPALITY

LAND USE CATEGORIES	AREA (Has)	PERCENT TO TOTAL
Urban Use Areas		
Residential	289	0.93%
Commercial	46	0.15%
Institutional	125	0.40%
Industrial	141	0.45%
Agriculture	18,436	59.18%
Forest (Production/Protection)	8,079	25.94%
Grassland	2,863	9.19%
Agro-Industrial	164	0.53%
Tourism	194	0.62%

LAND USE CATEGORIES	AREA (Has)	PERCENT TO TOTAL
Special Uses		
Cemeteries	22	0.07%
Eco-Park	3	0.01%
Slaughterhouse	1	
River/Creeks	788	2.53%
Roads	-	-
TOTAL	**31,150**	**100.00%**

FIGURE 2-4. LAND USE MAP OF TUPI, SOUTH COTABATO



Linan, as the direct impact area of the project, is classified as an Agricultural Zone based on the issued Zoning Certificate and other tenurial instruments.

2.1.2 Geology/Geomorphology

2.1.2.1Regional Setting

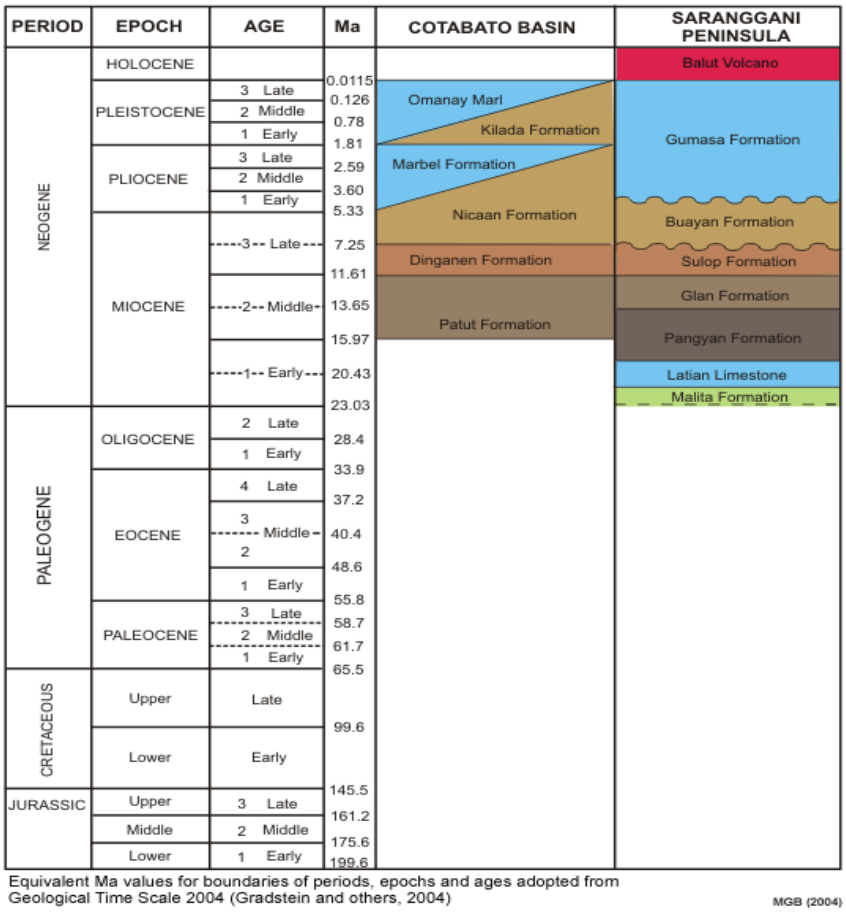
2.1.2.1.1. Geologic Setting

The Municipality of Tupi is geographically located on the Central portion of South Cotabato Province, within the geological complex of Cotabato basin. This layer of sedimentary basin is located between the active volcanic arcs of Cotabato and central Mindanao, which formed during Late Miocene – Pleistocene. It has a thickness of 8,000 meters, which composed mainly of relatively undeformed shallow marine deposits dominated by conglomerates, sandstones and shales underlain by more deformed sequence of volcaniclastics with minor intercalations of limestones (Ranneft

and others, 1960). The general stratigraphy of Cotabato basin is similar to that of the Agusan-Davao Basin, except that the upper Miocene - Pleistocene is more exposed.

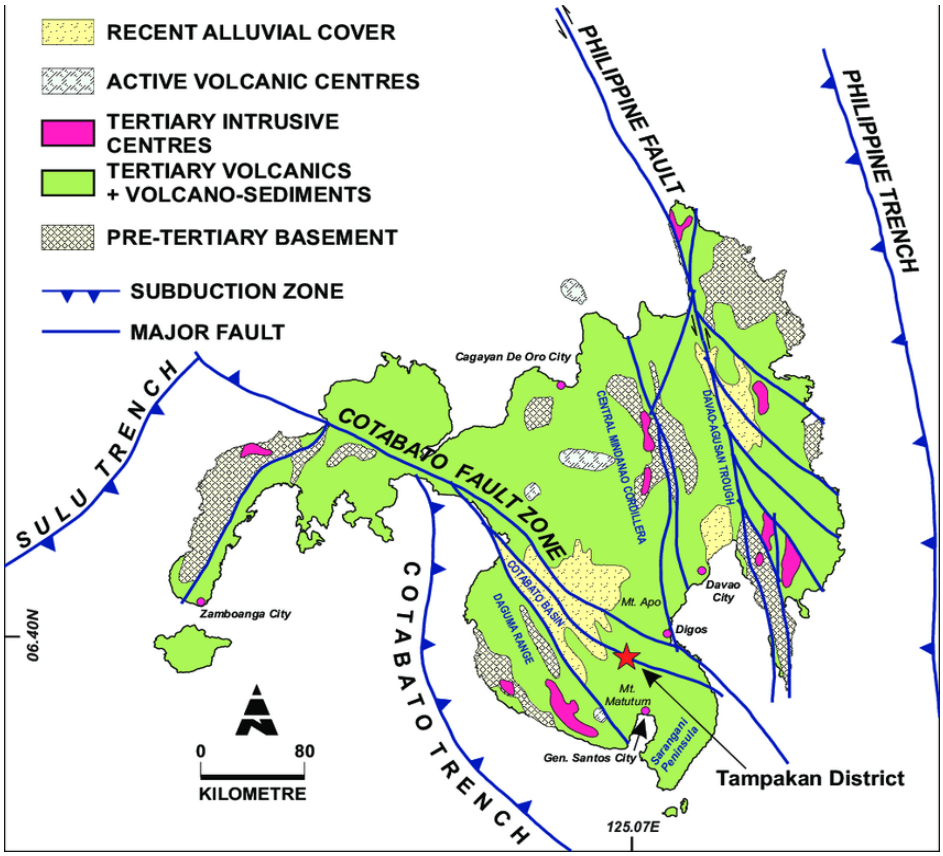
Regionally, The Municipality is underlain by the Marbel Formation (Froelich and Melendres, 1960) after the Pliocene sequence of biohermal limestone, marl, mudstone, sandstone and local beds of volcanic conglomerates exposed at Marbel, South Cotabato. On the north, the formation is represented by at least two distinct lithologies, namely: The San Mateo Mudstone consisting predominantly of tuffaceous mudstone interbedded with marl, limestone, tuffaceous sandstone and pebble conglomerate; and the biohermal Awang-Table Limestone. The formation is over 1,200 m thick in the area south of Mt. Matutum in central South Cotabato. The depositional environment of the Marbel is shallow marine to fluviatile.

FIGURE 2-5. STRATIGRAPHIC COLUMN OF COTABATO BASIN (LEXICON 2008).



The Municipality is located lying at the base of Mount Matutum and found adjacent at the highly mineralized Tampakan District. The Province of South Cotabato was traversed by a prominent North-West trending linear fracture zone of Cotabato fault zone, which features left-lateral faulting.

FIGURE 2-6. INTERPRETED GEOLOGY OF MINDANAO (MODIFIED AFTER DOMASIG ET AL 1998).

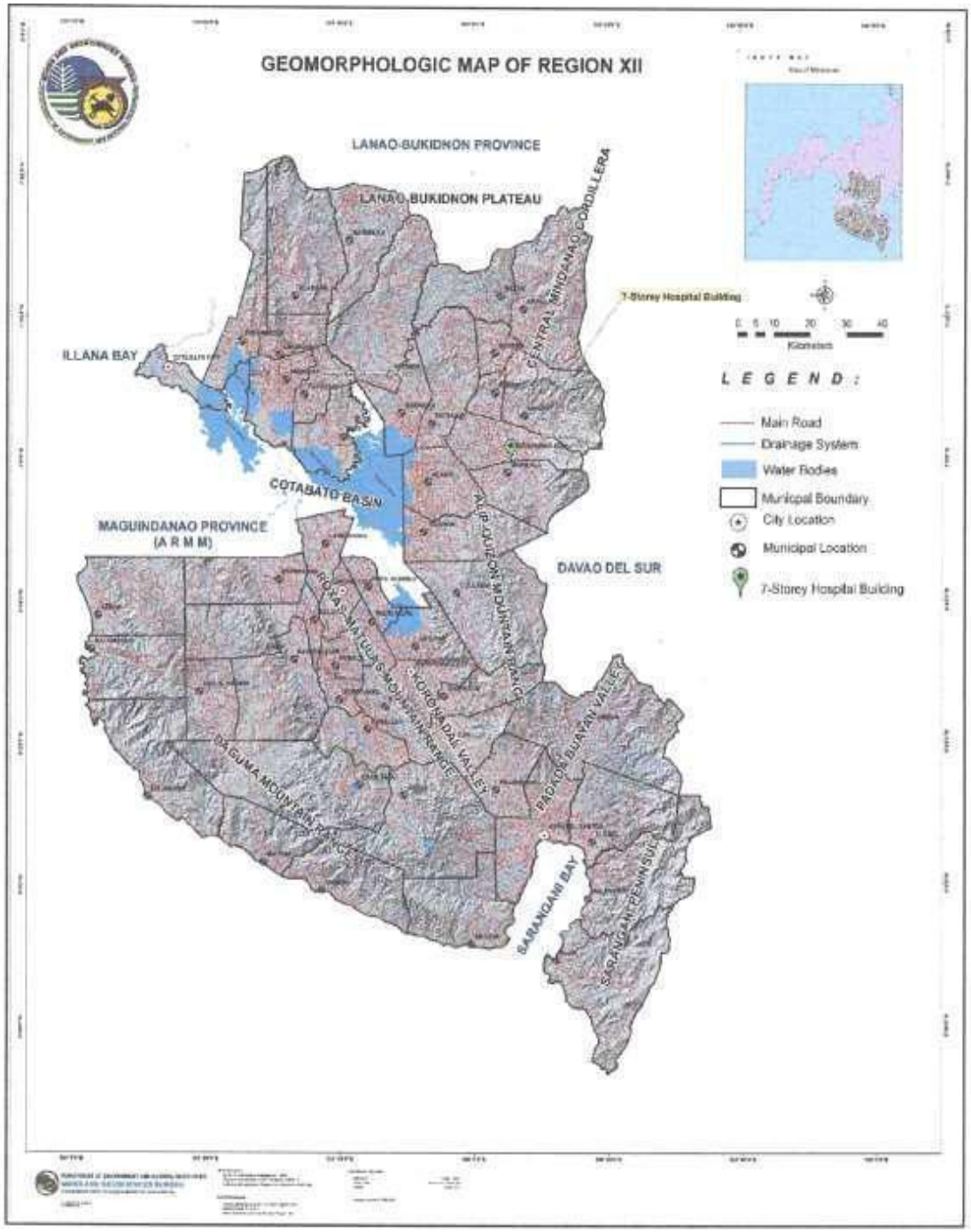


2.1.2.1.2 Geomorphology

The Municipality of Tupi is situated in a wide expanse of relatively flat terrain, the northeast section lies on a steep to very steep topography that is part of the nearby Mount Matutum Range, while in the southeastern section has a topography from flat to gently sloping, undulating to moderately steep slope.

The drainage condition is mostly poor with some other part which is classified as good to fair drainage. The good to fair drainage condition is mostly found along the plains and valleys of the province.

FIGURE 2-7. GEOMORPHOLOGIC MAP OF REGION XII



2.1.2.1.3 Climate and Vegetation

The vegetation in the direct impact area is open-canopy grassland mixed with a few shrubs and ornamental and fruit trees, while in the indirect impact is dominated by crops and shrubs with patches of trees. The specific details of vegetation characteristic of the project site are presented in 2.1.4.1.

The climate in the Municipality of Tupi is tropical. The average annual temperature is 21.6 °C or 70.8 °F, about 2195 mm or 86.4 inch of precipitation falls annually. The Municipality is experiencing a significant amount of rainfall, even in the driest month (Köppen-Geiger system). Also, the Municipality is rarely affected by typhoons for it is situated outside the typhoon belt, and is protected by its surrounding mountain ranges. Moreover, the area is classified as interplanted with crops and coconut species.

The figure below summarizes the weather of the region which indicates that the maximum rainfall recorded is on May to October. Throughout the year, temperatures vary by 1.4 °C or 2.5 °F.

FIGURE 2-8. AVERAGE WEATHER OF MUNICIPALITY OF TUPI (HTTPS://EN.CLIMATE-DATA.ORG/ASIA/PHILIPPINES/SOUTH-COTABATO)

	January	February	March	April	May	June	July	August	Septem-ber	October	November	December
Avg. Temperature °C (°F)	21.1 °C (69.9) °F	21.3 °C (70.3) °F	21.9 °C (71.3) °F	22.5 °C (72.4) °F	22.1 °C (71.8) °F	21.6 °C (70.9) °F	21.3 °C (70.3) °F	21.3 °C (70.4) °F	21.4 °C (70.6) °F	21.5 °C (70.7) °F	21.5 °C (70.7) °F	21.5 °C (70.6) °F
Min. Temperature °C (°F)	18.3 °C (65) °F	18.3 °C (64.9) °F	18.7 °C (65.7) °F	19.3 °C (66.8) °F	19.5 °C (67.1) °F	19.2 °C (66.5) °F	18.8 °C (65.9) °F	18.8 °C (65.9) °F	18.8 °C (65.9) °F	18.9 °C (66) °F	18.9 °C (66) °F	18.8 °C (65.8) °F
Max. Temperature °C (°F)	24.7 °C (76.5) °F	25.2 °C (77.4) °F	26 °C (78.9) °F	26.7 °C (80.1) °F	26 °C (78.8) °F	25.3 °C (77.5) °F	24.9 °C (76.9) °F	25.1 °C (77.1) °F	25.3 °C (77.6) °F	25.4 °C (77.7) °F	25.3 °C (77.5) °F	25.2 °C (77.3) °F
Precipitation / Rainfall mm (in)	163 (6.4)	118 (4.6)	129 (5.1)	138 (5.4)	229 (9)	256 (10.1)	218 (8.6)	211 (8.3)	192 (7.6)	217 (8.5)	180 (7.1)	144 (5.7)
Humidity(%)	84%	80%	78%	77%	84%	86%	86%	86%	85%	86%	86%	84%
Rainy days (d)	14	12	12	13	19	20	19	19	18	19	17	16
avg. Sun hours (hours)	7.3	7.6	8.0	8.4	7.8	7.9	7.9	7.9	7.9	7.6	7.4	7.5

2.1.2.2. Site Geology

2.1.2.2.1. Topography

The project site is located northern portion of the Municipality of Tupi wherein it lies in a terrain which varies from flat to gently sloping and up to undulating topography with estimated elevation of 312.4 meters above mean sea level. Based on the actual survey of the area, the project is situated within the agricultural area of the Municipality. The southern portion of the area is relatively lower compared to the northern part. However, the slope variation in the area has an estimated range of 3 meters or less.

FIGURE 2-9. TERRAIN MAP OF MUNICIPALITY OF TUPI (GOOGLE EARTH JUNE 2021)

2.1.2.2.2 Bedrock Lithology

The project site is consisting of unconsolidated clay, silt, sand, pebbles, angular and rounded gravel mixed in a sand or clay matrix. It shows mixed characteristics of volcanic and sedimentary origin. This landform is very extensive. These are alluvial deposits that are found in the Province, typically in Marbel and Allah Valleys.

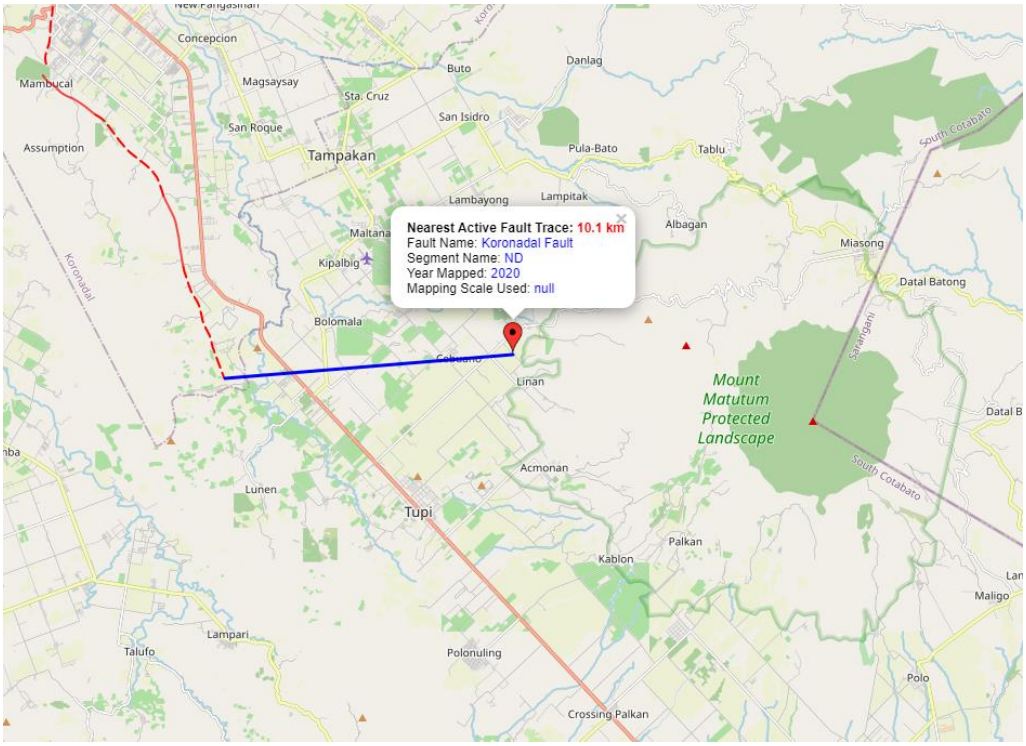
Residual Terraces was also found in the project area and are derived from both sedimentary and igneous rocks. Sedimentary formations include limestone, shale, siltstone and conglomerates. Igneous formations are derived from quaternary volcanic pyroclastics, volcanic agglomerates, ultrabasic rock and metavolcanics.

The area is also underlain by Volcanic footslopes which are composed of thick and extensive pyroclastics, consisting of various volcanic ejecta including lapilli, tuff, breccia, mixed with volcanic sand, ash and andesite boulders from the Mount Matutum and Apo Parker volcanoes.

2.1.2.2.3 Structural features

The nearest geologic structure to the project site is the Cotabato Fault Segment, this segment is identified to be linear and has features indicative to normal faulting even though it may have been left lateral strike slip fault during its early history. Furthermore, there is only one (1) active fault near the project area, the Koronadal Fault. The former is located west from the project site and has a relative distance of approximately 10.1 kilometers and identified trending South-Southeast (SSE).

FIGURE 2-10. MAP SHOWING THE NEAREST ACTIVE FAULTS IN THE PROJECT SITE (PHIVOLCS - FAULT FINDER).



2.1.2.3. Natural Hazards

Geologic Hazards can produce significant damage when infrastructure is constructed in their presence and capable enough to cause harm or even result to loss of life. It gives unique challenge to identify and evaluate due to its unpredictable nature. The Philippine archipelago experiences numerous Geologic hazards such as earthquake, volcanic eruption, landslide, erosion, flooding and annual onslaught of dangerous storms.

2.1.2.3.1. Seismic Hazards

Seismic hazards or earthquake related hazards are well-recognized geologic hazards in the Philippines considering that the country is volcanic in origin and located in a tectonically active region in Asia pacific. With Mindanao recently experienced devastating earthquakes, hazards associated with seismic activity such as Ground shaking, liquefaction and differential settlement are the major concerns in the project site.

2.1.2.3.1.1. Ground acceleration/ shaking

Ground acceleration or also known as ground shaking is the primary earthquake hazard that it is the result of rapid ground acceleration, which is defined as a measure of how quickly the ground changes velocity during the earthquake. Areas prone to this hazard are those underlain by thick and poorly unconsolidated materials.

However, it can vary over an area because of factors such as topography, bedrock type and the location and orientation of the fault rupture.

The project site is underlain by soft to stiff soil, which is susceptible to ground shaking. Based from the active fault map of Philippine Institute of Volcanology and Seismology (PHIVOLCS), the nearest active fault in the project site is the Koronadal fault that is part of the segment of Cotabato Fault and located 10.1 kilometers west of the area.

FIGURE 2-11. SEISMICITY MAP SHOWING EARTHQUAKES AND AFTERSHOCKS IN REGION XII

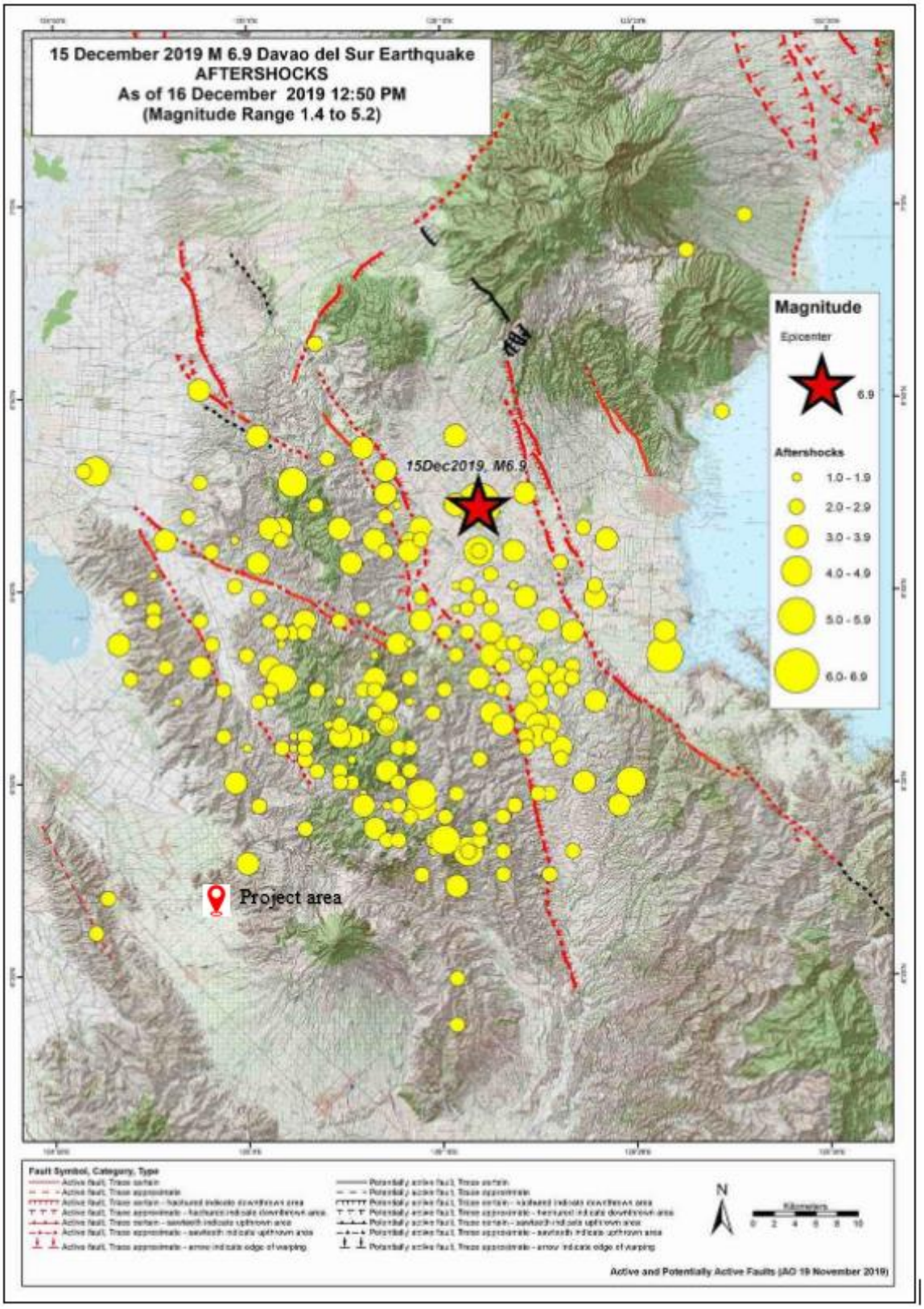
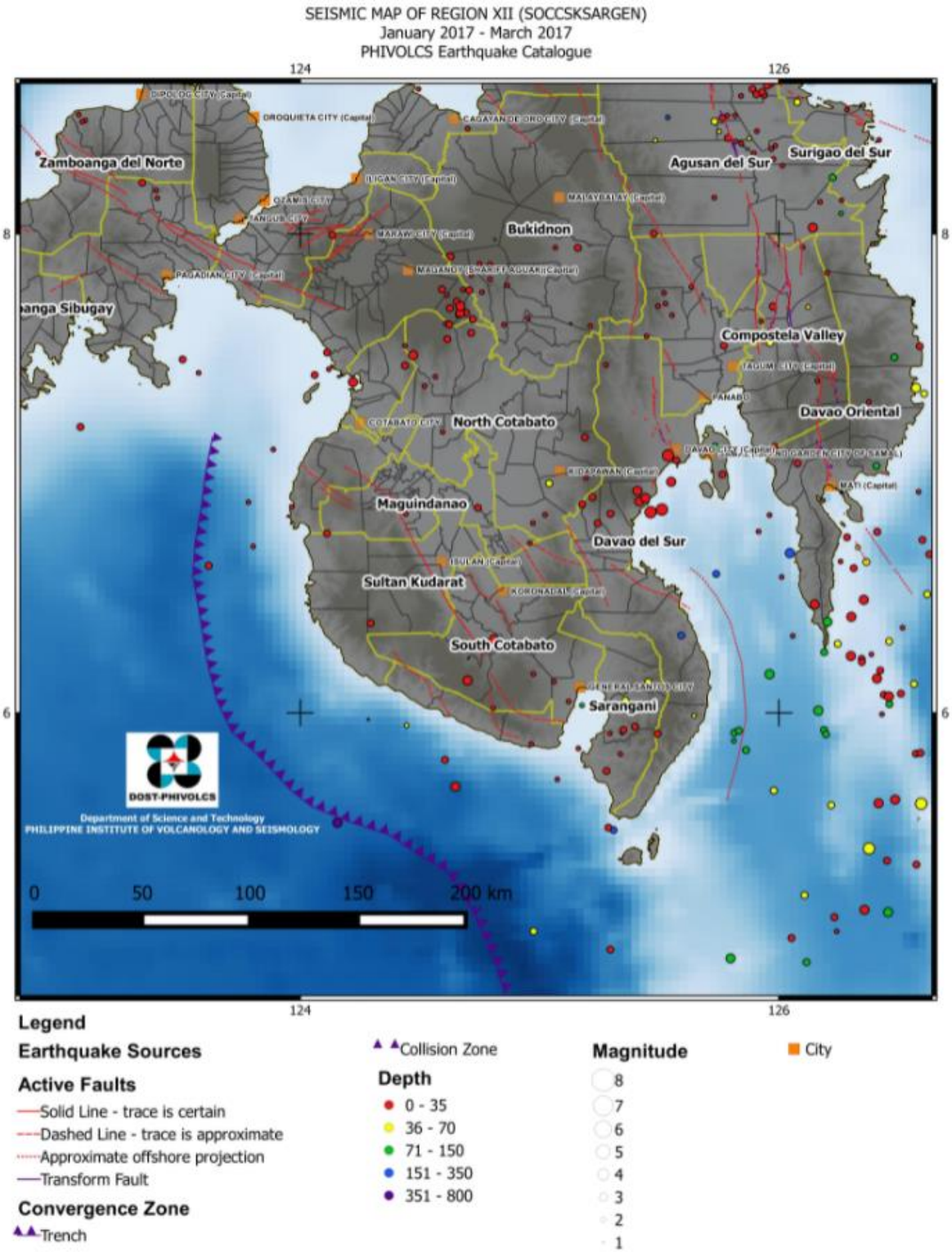


FIGURE 2-12. SEISMICITY MAP OF REGION XII (PHIVOLCS)

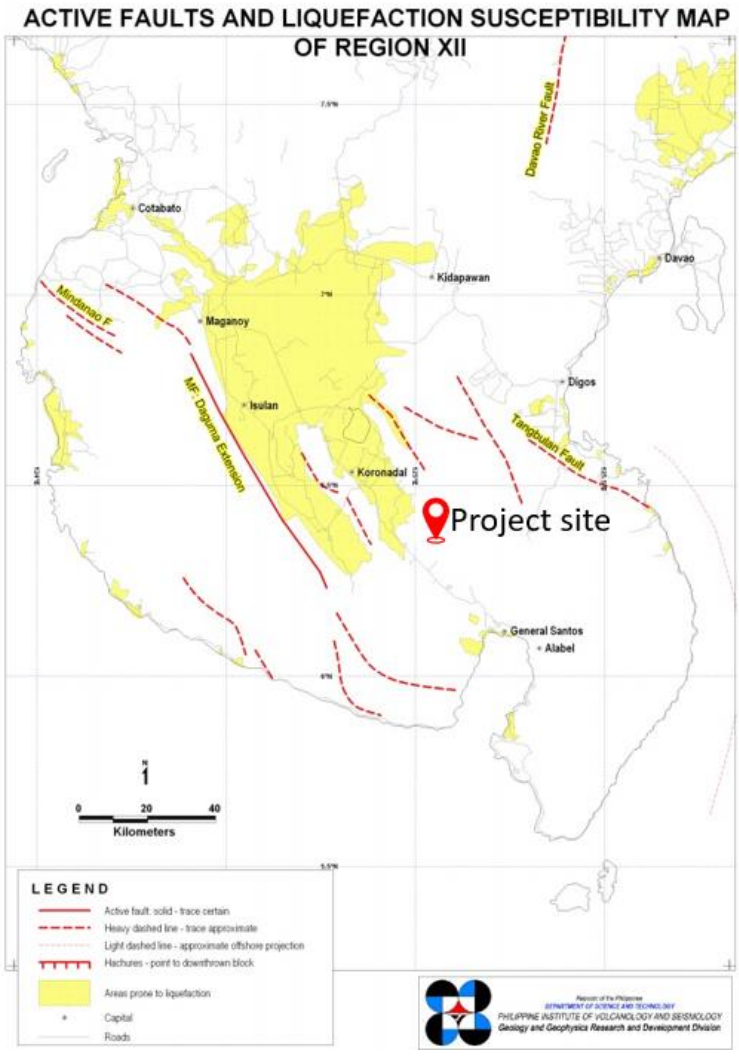


2.1.2.3.1.2 Liquefaction

Liquefaction is a phenomenon in which the strength of a soil is reduced due to earthquake occurrences. Liquefaction occurs in saturated soil wherein the space between individual particles of the soil is filled up with water. Earthquake shaking frequently causes the increase of water pressure that influences the behavior of the tightly pressed particles to readily move with respect to each particle. In areas where unconsolidated materials are saturated with water, earthquake vibrations can turn a stable soil into a mobile fluid that can cause tremendous amount of damages to building, other built-up infrastructures and can even loss of lives.

Based on the Liquefaction Susceptibility Map of Region XII from PHIVOLCS, the project site does not located in liquefiable zones of the region. Furthermore, field observation a d subsurface investigation confirms that the underlying recent deposits are outside the liquefiable zones.

FIGURE 2-13. ACTIVE FAULTS AND LIQUEFACTION SUSCEPTIBILITY MAP OF REGION XII BY PHIVOLCS.

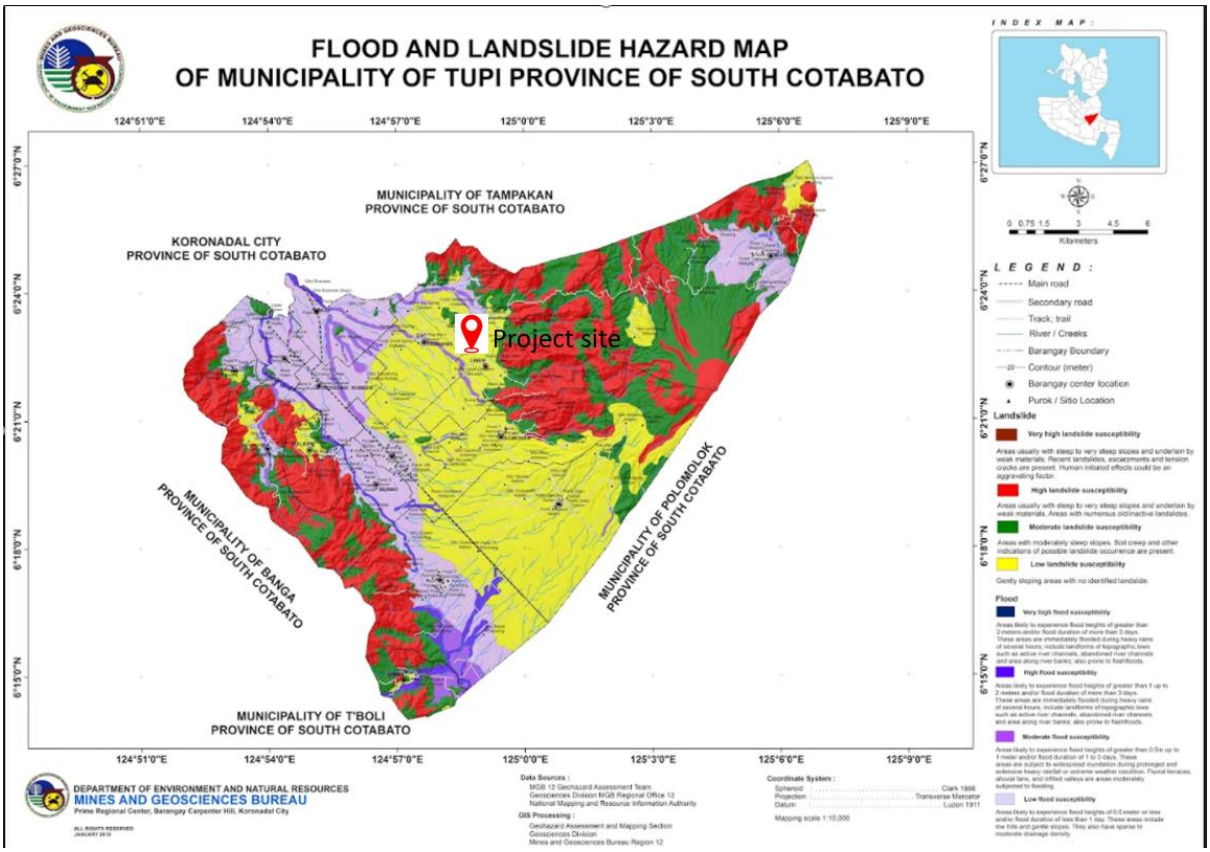


2.1.2.3.1.3. Mass Movements

Mass movement refers to the downslope movement of rock, regolith, and soil under the direct influence of gravity. Before mass movement such as landslides occur, several processes work to weaken slope material, gradually making it more susceptible to the pull of gravity until it reaches its threshold from stability to instability.

The area of the project site is situated in a relatively flat to gently sloping terrain indicative of low susceptibility mass movements such as but not limited to landslides and slumps. Also, the MGB landslide susceptibility map of Municipality of Tupi shows that the project site is located in an area with low susceptibility to landslide.

FIGURE 2-14. LANDSLIDE HAZARD MAP OF MUNICIPALITY OF TUPI, SOUTH COTABATO. (MGB RXII GSSR, 2020)



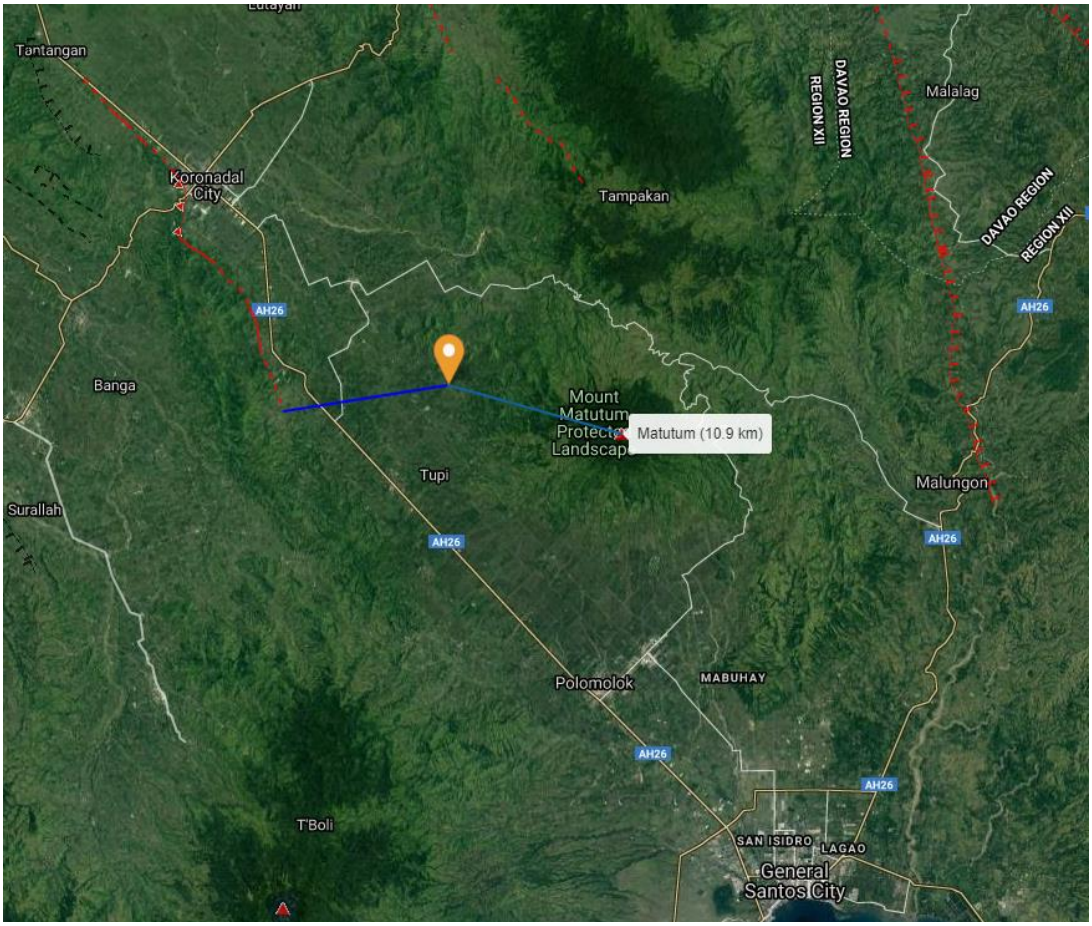
2.1.2.3.1.4 Volcanic Hazards

Volcanic related hazards can be devastating. It occurs before, during and after volcanic eruptions. Hazards such as large explosive eruptions, pyroclastic flows, and

lahars can produce significant damage that may cause loss of life, injury, property destruction, social and economic disruption or environmental degradation.

Based on the volcanic hazards assessment of PHIVOLCS, the project site is safe from lava, lahar and pyroclastic flow. The nearest active volcano in the project site is Mt. Matutum with approximately 10.9 kilometers south from the project site. However, considering the distance of the project site from these active volcano, pyroclastic flow such as deposition of volcanic ash in the area should not be disregarded.

FIGURE 2-15. LOCATION OF ACTIVE VOLCANO (MT. MATUTUM) RELATIVE TO THE PROJECT SITE (PHIVOLCS: HTTPS://HAZARDHUNTER.GEORISK.GOV.PH/MAP#)



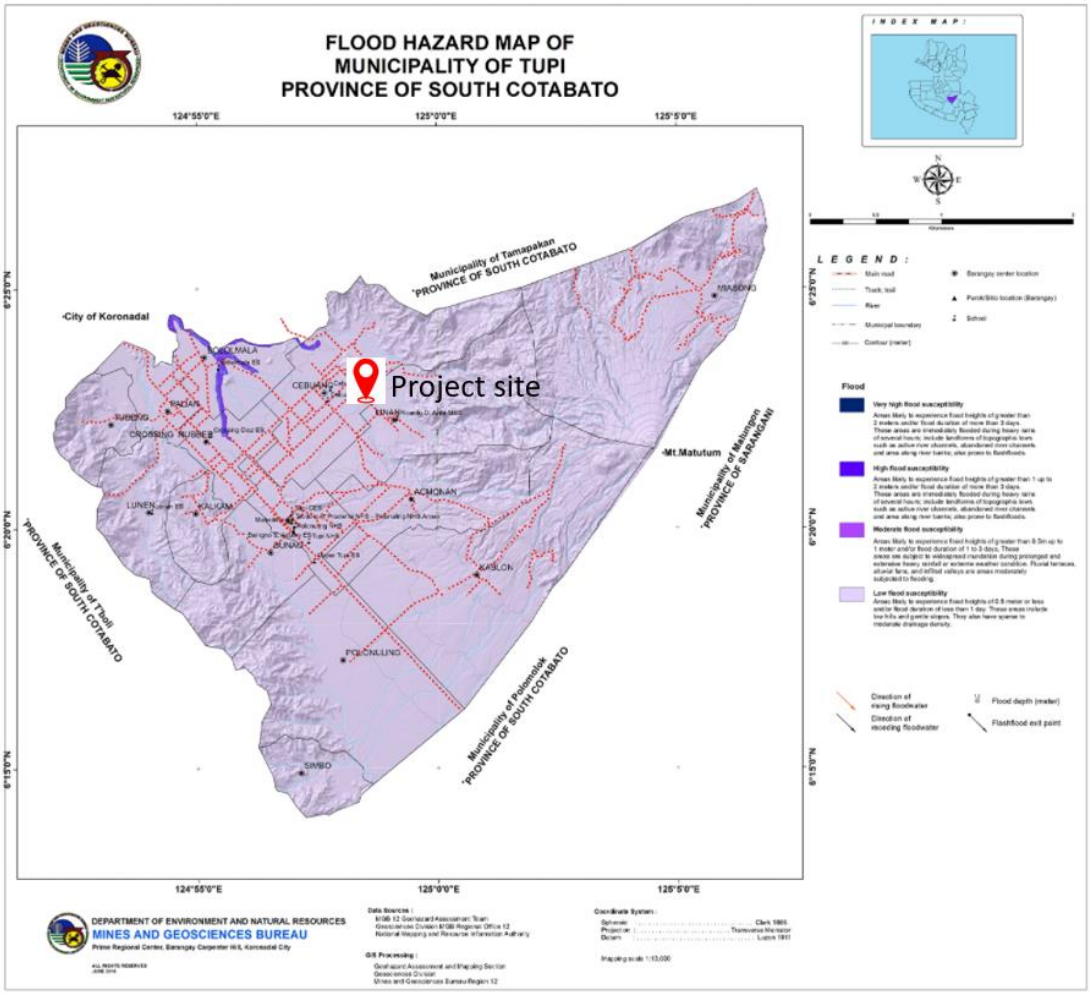
2.1.2.3.2 Hydrological Hazards

2.1.2.3.2.1 Fluvial Hazards

The Philippines experiences significant amount of rainfall for it is located in a typhoon belt setting. Fluvial hazards that occurred in the country had brought numerous damages including properties and loss of people's lives. Fluvial hazards occurs when the flow of stream becomes so great that it exceeds the capacity of its channel and overflows in its banks and flows down towards the lower elevation in the area.

Based on the MGB RXII Geological Site Scoping Report, the project site is located in an area with low flood susceptibility wherein the area experiences a flood height ranges from 0.50 meter to one (1) meter with flood duration of one (1) to two (2) days. Also, the area can possibly experience a widespread inundation during prolonged and extensive rainfall or extreme weather condition.

FIGURE 2-16. FLOOD HAZARD MAP OF MUNICIPALITY OF TUPI, SOUTH COTABATO. (MGB RXII)



2.1.3 Pedology

2.1.3.1 Methodology

Field investigation, including collecting of soil sample within the project area on and subsequent analysis by a testing laboratory were conducted to study and assess the soil environment. Also, desktop review of publicly available information were gathered and reviewed in preparing this section.

2.1.3.2 Results

The terrain is undulating, with a slope of around 300 meters and the highest altitude of 250 meters above mean sea level (amsl). According to the geohazard map, the project has a low to moderate vulnerability to landslides. However, any modification of the region that needs more soil exposure might exacerbate soil erosion.

2.1.3.2.1 Soil Types

Barangay Linan's soil is categorized as sandy loam. The kind of top soil affects the likelihood of landslides and flash floods through the material composting the soil, the level of compaction, and the quality of the soil cover.

2.1.3.2.2 Soil Profile and Soil Fertility

The project area's soil falls under sandy loam category, the same as that of the soil type of Barangay Linan.

Results indicate that the fertility level of the soil at the project site is indicate that the soil quality surrounding the project site are highly fertile. Which is also evident in the various high value crops being cultivated within the area. Barangay Linan and its neighbor, Barangay Cebuano largely depend on agriculture. Based on the results of soil analysis, there is negligible levels of Hexavalent Chromium or Lead which are both considered toxic and bioaccumulating. The soil within the project site is free from these harmful elements including persistent organic pollutants as revealed by both soil and water sampling results. (Tables 2-3) shows the results of soil quality analysis from different sampling points within the primary impact areas of the golf course project.

According to the Philippine Bureau of Soils and Water Management, pH levels ranging from 5.5-7.5 indicate high soil fertility. Total nitrogen levels greater than 0.25 also fall within high soil fertility. Other parameters also indicate high soil fertility.

TABLE 2-3. SOIL SAMPLING STATION 1. NEAR CLUB HOUSE

Test Description	Results	Units
pH	6.2	-
Chloride	1.719	ppm
Boron	0.719	%
Lead	<0.10	mg/kg
Manganese	107.17	mg/kg
Copper	10.16	mg/kg
Zinc	15.34	mg/kg
Cobalt	<0.20	mg/kg
Hexavalent Chromium	<0.10	mg/kg
Total Nitrogen	0.3	%
Total Phosphorus	0.029	%
Total Potassium	<0.20	mg/kg
Molybdenum	<0.20	mg/kg
Organic Matter	4.453	%

TABLE 2-4. SOIL SAMPLING STATION 2. PROPERTY PERIMETER DOWNHILL

Test Description	Results	Units
pH	7.0	-
Chloride	2.579	ppm
Boron	0.809	%
Lead	<0.10	mg/kg
Manganese	119.83	mg/kg
Copper	11.19	mg/kg
Zinc	20.28	mg/kg
Cobalt	<0.20	mg/kg
Hexavalent Chromium	<0.10	mg/kg
Total Nitrogen	0.1	%
Total Phosphorus	0.034	%
Total Potassium	<0.20	mg/kg
Molybdenum	<0.20	mg/kg
Organic Matter	3.054	%

TABLE 2-5. SOIL SAMPLING STATION 3. PROPERTY PERIMETER UPHILL

Test Description	Results	Units
pH	5.9	-
Chloride	0.860	ppm

Boron	0.509	%
Lead	<0.10	mg/kg
Manganese	159.28	mg/kg
Copper	14.93	mg/kg
Zinc	22.25	mg/kg
Cobalt	<0.20	mg/kg
Hexavalent Chromium	<0.10	mg/kg
Total Nitrogen	0.3	%
Total Phosphorus	0.037	%
Total Potassium	<0.20	mg/kg
Molybdenum	<0.20	mg/kg
Organic Matter	4.804	%

TABLE 2-6. SOIL SAMPLING STATION 4. OUTSIDE PROPERTY UPHILL

Test Description	**Results**	**Units**
pH	5.8	-
Chloride	0.860	ppm
Boron	0.718	%
Lead	<0.10	mg/kg
Manganese	235.14	mg/kg
Copper	17.25	mg/kg
Zinc	41.45	mg/kg
Cobalt	<0.20	mg/kg
Hexavalent Chromium	<0.10	mg/kg
Total Nitrogen	0.4	%
Total Phosphorus	0.153	%
Total Potassium	<0.20	mg/kg
Molybdenum	<0.20	mg/kg
Organic Matter	8.737	%

FIGURE 2-17. SOIL SAMPLING DOCUMENTATION

TABLE 2-7. SOIL SAMPLING LOCATIONS

Plot	Latitude	Longitude	Elevation (ft)
Plot 1	6.380556	124.9806	1229
Plot 2	6.382778	124.9786	1191
Plot 3	6.376944	124.9819	1302
Plot 4	6.378333	124.9842	1299

FIGURE 2-18. SOIL MAP OF THE MUNICIPALITY OF TUPI

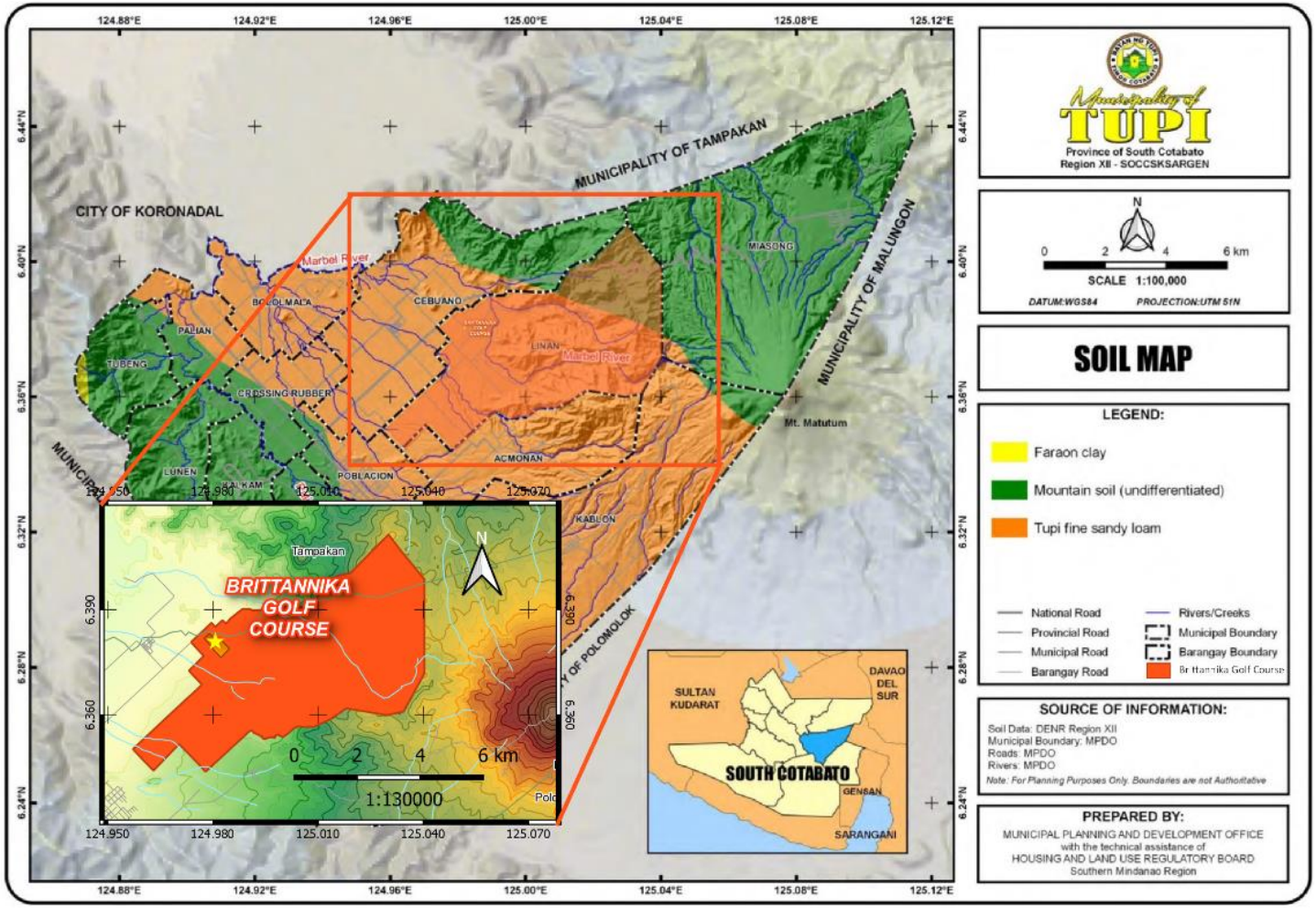
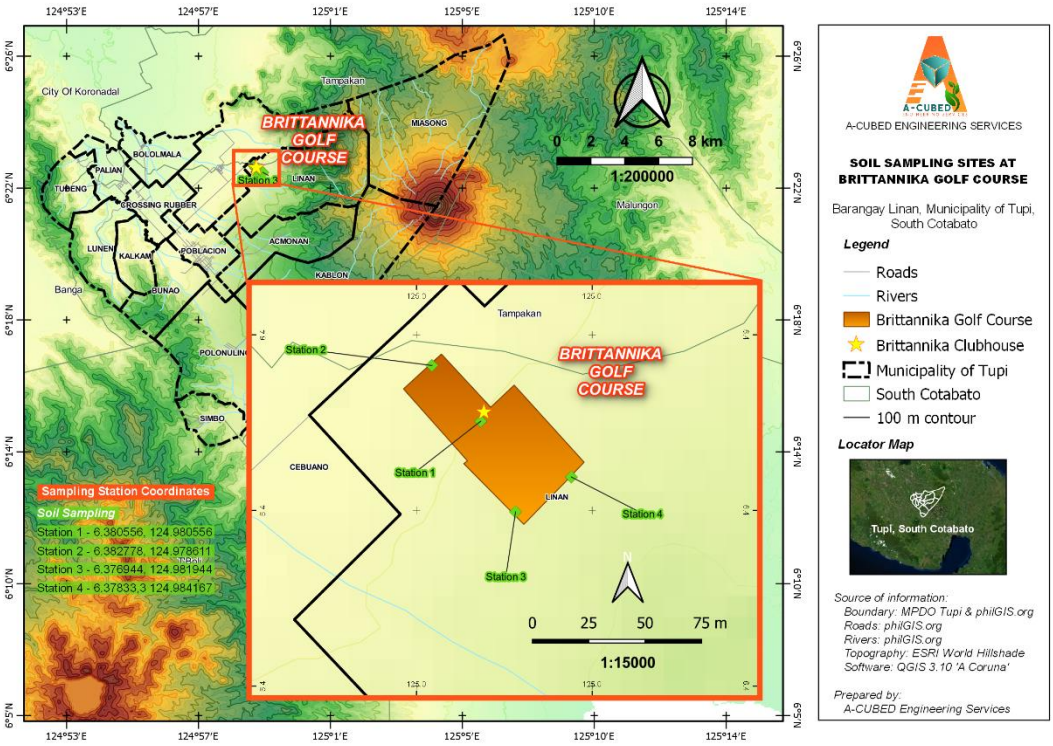


FIGURE 2-19. SOIL SAMPLING MAP



2.1.3.3 Impacts and Mitigating Measures

2.1.3.3.1 Soil Erosion/ Loss of Topsoil

The project has implemented its development at the time this report was written. Disturbance of topsoil and siltation most likely occur during the development. However, it was expected that said occurrence was minimal because the project is situated in a relatively flat terrain and only the development of the artificial lakes entailed excavation works. It is recommended to conduct earthworks during dry season to minimize to possible soil erosion. Progressive clearing and earthworks moving can also be implemented to the remaining undeveloped area to minimize the said soil erosion. Immediate revegetation of carabao grass can also be conducted to reduce rainfall impact to soil that cause soil erosion during wet season.

2.1.3.3.2 Change in Soil Quality/Fertility

The project will apply fertilizer during the project operation to maintain the turf grass and vegetation, and other flora species that will be planted and maintained in the golf course. This will enhance the soil fertility of the project that has low to very low fertility prior to the project.

2.1.3.3.3 Impacts of Spoils Materials

During the clearing, grubbing, and stump removal operations, the cleared topsoil shall be placed in a designated area with a provision of proper drainage system to avoid possible siltation during heavy rains. Staging area for spoils materials will be

designated and located in strategic areas where other project areas that require filling materials can be easily backfilled.

Stockpile management practices for temporary stockpile sites related to construction works will be in accordance with best engineering management practices and shall take into account the following general principles:

- Provision for soils erosion and sediment control measures such as establishment of diversion canals and proper drainage system.
- Controlling run-off during the construction of stockpiles (e.g. fill shaping and the construction of temporary dykes and batter drains).
- Diverting stockpile run-off through sediment traps and into pits and the stormwater drainage system as soon as practical to reduce surface flow lengths and velocities.
- Controls will be installed around all stockpiles that are in place for more than 1month in order to prevent wind and water erosion.
- Dust management measures (including for vehicle movements associated with stockpiling activities)

2.1.3.3.4 Soil Quality Mitigation and Monitoring

Soil degradation in the project site will lead directly to water pollution by sediments with carry-over of trace amounts of fertilizers and pesticides from eroded spoils and fields. Soil degradation indirectly causes water pollution by increasing erosive ability of runoff and by reducing the soil's ability to hold or immobilize nutrients. To mitigate the possible impact of soil degradation, primarily due to erosion and consequently the pollution of downstream creek along within one kilometer radius

2.1.4 Terrestrial Ecology

The terrestrial ecology assessment of the Brittanika Golf Course (the Project site) is based on the signed and approved technical scoping checklist for the Environmental Impact Statement of the Project.

2.1.4.1 Terrestrial Flora

2.1.4.1.1 Methodology

2.1.4.1.1.1 Vegetation Characterization and Site Description

The general vegetation was characterized for both direct and indirect impact areas of the Project. Each plant and tree species recorded inside and outside the quadrats were photographed and identified to the lowest possible level using the available taxonomic literature and photographic guides (e.g., Co's Digital Flora of the Philippines). The threatened species were checked using the DENR Department Administrative Order 2017-11 and the IUCN Red List of Threatened Species. All species recorded were presented in the flora checklist in Table 2-10.

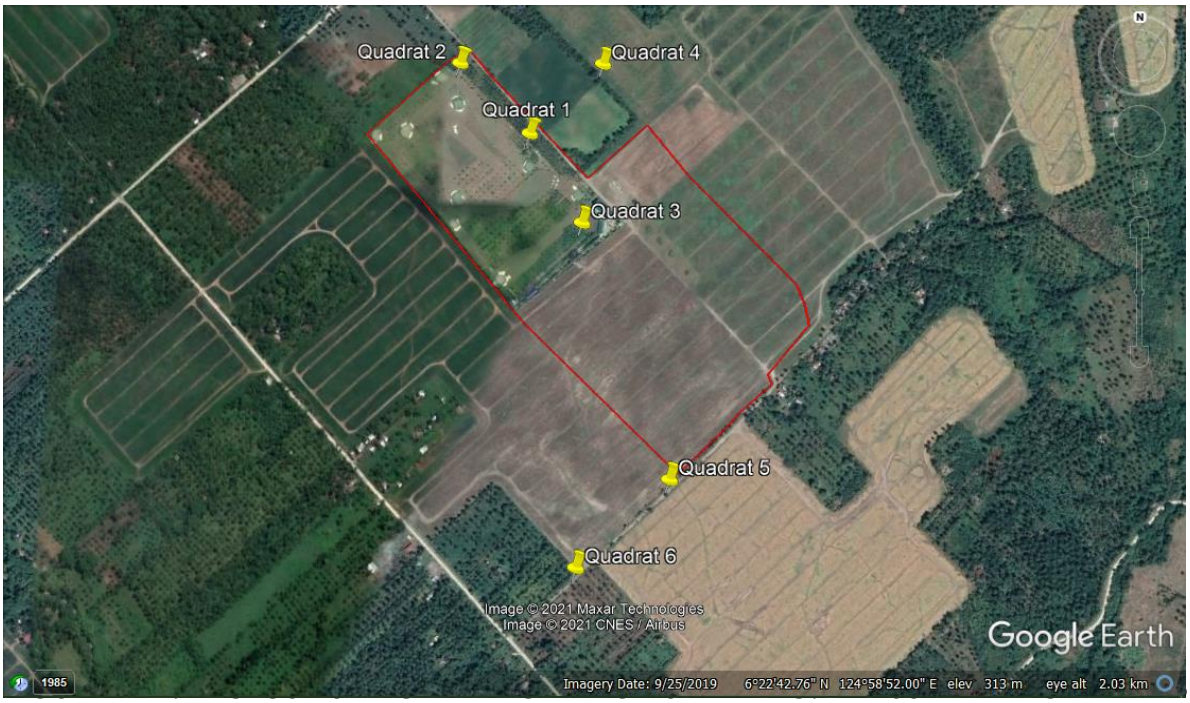
2.1.4.1.1.2 Field Sampling Methodology

A quadrat survey was employed to assess the vegetation characteristics within the direct and indirect impact areas of the Project. Six (6) 10 m x 10 m quadrats were purposedly established in vegetated areas, three (3) of which were within the direct impact area and another three (3) in the indirect impact area. The DBH was measured using a handheld tape measure. All trees with >15 diameter at breast height (DBH) were counted to serve as tree density. The overstory density was measured at the center of the quadrat using a Spherical Densiometer. This was held in front of the body at elbow height to record the readings. The percent understory cover was estimated.

TABLE 2-8. QUADRAT LOCATIONS FOR VEGETATION SAMPLING

Quadrat	Latitude	Longitude	Elevation (masl)
Q1	6°22'54.00"N	124°58'48.00"E	299
Q2	6°22'58.00"N	124°58'44.00"E	287
Q3	6°22'49.00"N	124°58'51.00"E	306
Q4	6°22'58.00"N	124°58'52.00"E	298
Q5	6°22'35.00"N	124°58'56.00"E	325
Q6	6°22'30.15"N	124°58'51.02"E	320

FIGURE 2-20. GOOGLE EARTH MAP SHOWING THE RELATIVE LOCATIONS OF QUADRATS FOR VEGETATION SAMPLING IN THE DIRECT (Q1, Q2, Q3) AND INDIRECT (Q4, Q5, Q6) IMPACT AREAS



H

(LEFT) AND OVERSTORY DENSITY (RIGHT)

i

2.1.4.1.1.3 Ecological Parameters (Statistical Analysis)

Sampling adequacy was examined using indiviudal-based rarefaction and extrapolation (R/E) curves and a sample completeness curve for the three most common measures of diversity: species richness, Shannon diversity, and Simpson diversity. These were computed and plotted with 95% confidence intervals in the R package *iNEXT* (Hsieh *et al*. 2016). A similar analysis was used to check for diversity of flora between direct and indirect impact areas. The R/E curves help evaluate the completeness of sampling and facilitate a conservative comparison of species richness between impact areas despite the differences in the sampling effort. Only those species observed in the quadrats were included in the analysis. We performed the analysis in the R statistical software Version 1.1.463 (R Core Team 2020). For the Evenness index, the value of Shannon diversity was divided by the natural logarithm (ln) of the species richness (Maguran, 1988). The diversity indexes were interpreted using the categories of Fernando (1998).

TABLE 2-9. RELATIVE VALUES FOR PLANT SPECIES DIVERSITY BY FERNANDO (2008)

Relative Values	Shannon Diversity	Evenness Index
Very High	3.500 – 4.000	0.750 – 1.000
High	3.000 – 3.499	0.500 – 0.740
Moderate	2.500 – 2.999	0.250 – 0.490
Low	2.000 – 2.499	0.150 – 0.240
Very Low	1.999 and below	0.140 and below

2.1.4.1.2 Baseline Results

2.1.4.1.2.1 General Description of Vegetation of the Project Site

A total of 39 flora species were inventoried, of which 19 species were recorded in the direct impact area and 25 species in the indirect impact area. There were 17 native species recorded but none of which are Philippine endemic. Two species recorded are threatened under the Philippine Red List.

TABLE 2-10. LIST OF FLORA SPECIES RECORDED DURING VEGETATION ASSESSMENT

No.	Family	Scientific Name	Common Name	IUCN	DAO 2017-11	Frequency
1	Acanthaceae	*Asystasia gangetica*	Creeping foxglove	NE	OWS	30

No.	Family	Scientific Name	Common Name	IUCN	DAO 2017-11	Frequency
2	Annonaceae	*Annona muricata*	Soursop	LC	OWS	11
3	Aracauriaceae	*Aracauria heterophylla*	Pine trees	LC	OWS	6
4	Araceae	*Colocasia esculenta*	Taro	LC	OWS	3
5	Arecaceae	*Cocos nucifera*	Coconut	NE	OWS	4
6		*Wodyetia bifurcata*	Foxtail Palm	NE	OWS	1
7	Bromeliaceae	*Ananas comosus*	Pineapple	NE	OWS	1
8	Euphorbiaceae	*Hevea brasiliensis*	Rubber tree	LC	OWS	1
9		*Manihot esculenta*	Cassava	NE	OWS	1
10		*Melanolepis multiglandulosa*	Alim	LC	OWS	1
11	Fabaceae	*Leucaena leucocephala*	Ipil-ipil	NE	OWS	2
12		*Gliricidia sepium*	Madre de cacao	LC	OWS	5
13		*Pterocarpus indicus*	Narra	EN	VU	6
14		*Mimusa pudica*	Makahiya	NE	OWS	1
15		*Gliricidia sepium*	Madre de cacao	LC	OWS	1
16	Lauraceaae	*Litsea cordata*		LC	OWS	1
17		*Litsea* cf. *glutinosa*		LC	OWS	1
18		*Persea americana*	Avocado	LC	OWS	1
19	Linderniaceae	*Torenia cristata*		LC	OWS	1
20	Lygodiaceae	*Lygodium japonicum*	Nito	NE	OWS	2
21	Malvaceae	*Theobroma cacao*	Cacao	NE	OWS	6
22		*Ceiba pentandra*	Kapok	LC	OWS	1
23	Meliaceae	*Sandoricum koetjape*	Santol	LC	OWS	5
24	Meliaceae	*Swietenia macrophylla*	Honduras mahogany	VU	OWS	13
25	Moraceae	*Artocarpus heterophyllus*	Jackfruit	NE	OWS	6
26	Musaceae	*Musa acuminata*	Edible Banana	LC	OWS	1
27	Nephrolepidaceae	*Nephrolepis falcata*		NE	OWS	4
28	Pinaceae	*Pinus* sp.	Pine trees	NE	OWS	10
29	Poaceae	*Dendrocalamus strictus*	Solid Bamboo	NE	OWS	1
30		*Pseudosasa japonica*	Arrow bamboo	NE	OWS	1
31		*Paspalum conjugatum*	Carabao Grass	LC	OWS	1
32		*Zoysia matrella*	Manila grass	NE	OWS	2
33		*Cymbopogon citratus*	Lemon Grass	NE	OWS	1
34	Polypodiaceae	*Aglaomorpha heraclea*		NE	VU	1

No.	Family	Scientific Name	Common Name	IUCN	DAO 2017-11	Frequency
35	Pteridaceae	*Pityrogramma calomelanos*		NE	OWS	4
36		*Pteris vitata*		NE	OWS	2
37	Solanaceae	*Capsicum annuum*	Sili	LC	OWS	1
38		*Solanum melongena*	Eggplant	NE	OWS	1
39	Thelypteridaceae	*Christella* sp.		NE	OWS	5

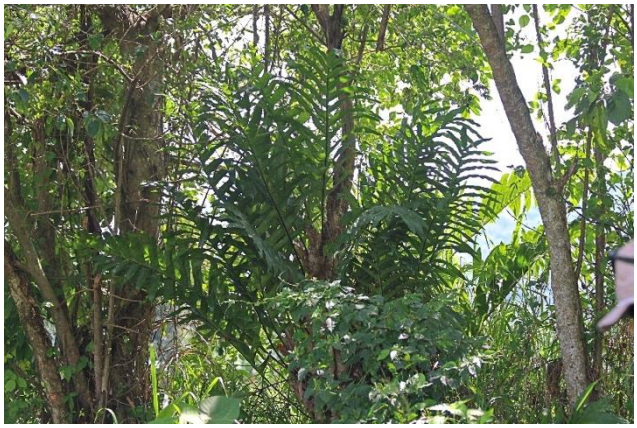
Note: NE = not evaluated, LC = least concern, VU = vulnerable, OWS= other wildlife specie

FIGURE 2-22. *DENDROCALAMUS STRICTUS* (LEFT; INDIRECT IMPACT AREA) AND *ASYSTASIA GANGETICA* (RIGHT; QUADRAT 5)

FIGURE 2-23. *LITSEA CORDATA* (LEFT; QUADRAT 4) AND *LITSEA CF. GLUTINOSA* (RIGHT; QUADRAT 4)

FIGURE 2-24. *MELANOLEPIS MULTIGLANDULOSA* (LEFT; QUADRAT 4) AND *COLLOCASIA ESCULENTA* (RIGHT; QUADRAT 4)

FIGURE 2-25. *LYGODIUM JAPONICUM* (LEFT; QUADRAT 3) AND *AGLAOMORPHA HERACLEA* (RIGHT; QUADRAT 4)

The direct impact area of the Project has already been converted into a golf course, characterized by almost uniformly trimmed grass (*Zoysia matrella*) and various ornamental (e.g., *Pinus* spp., *Araucaria heterophylla*) and fruit trees (e.g., *Anona muricata*, *Theobroma cacao*) planted along the edges and in certain portions within the golf course. The tree DBH is 11.9 cm on average and ranges from 7.8–23.7 cm. The canopy cover is about 80% and the understory vegetation is about 40% since it was covered mostly with leaf litter.

Adjacent to the golf course are mostly agricultural plots of pineapple (*Ananas comosus*), sweet potato (*Ipomoea batatas*), guava (*Psidium guajava*), papaya (*Carica papaya*), and corn (*Zea mays*). Only a few patches of trees are present in adjacent areas (indirect impact areas), such as mahogany (*Sweitennia macrophylla*), narra (*Pterocarpus indicus*), and coconut (*Cocos nucifera*). The tree DBH is 21.1 cm on average and ranges between 6.8–40.8 cm. The canopy cover is about 50% and the percent understory vegetation ranges from 30-70%.

FIGURE 2-26. PHOTOS SHOWING THE SITES IN THE DIRECT IMPACT AREA WHERE QUADRATS WERE ESTABLISHED.

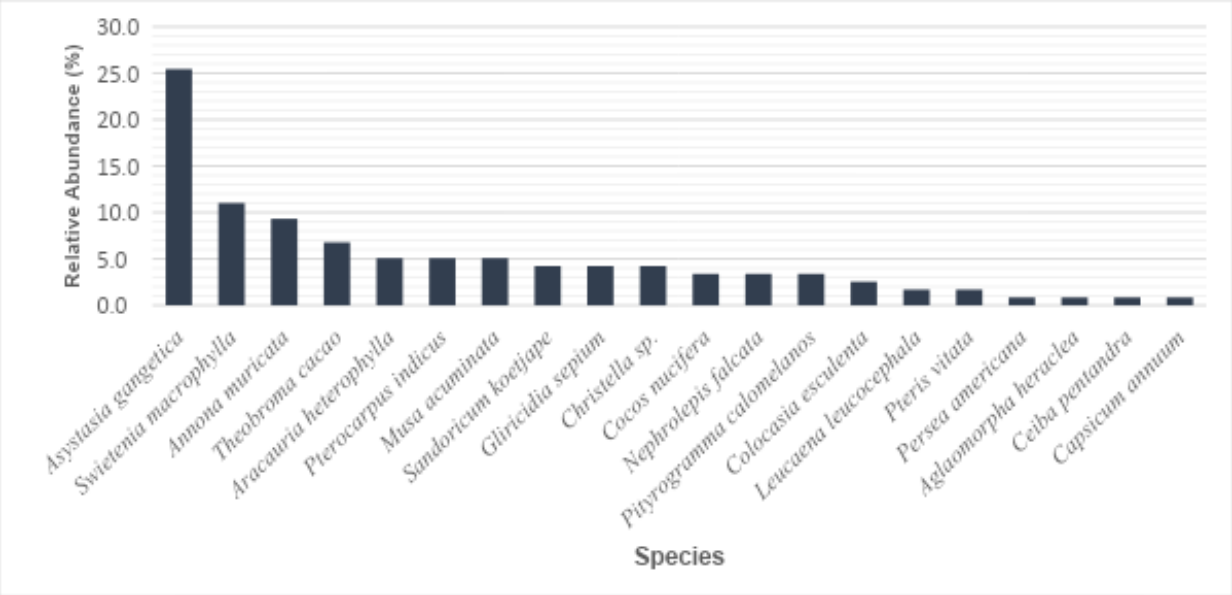

FIGURE 2-27. PHOTOS SHOWING THE SITES IN THE INDIRECT IMPACT AREA WHERE QUADRATS WERE ESTABLISHED.

2.1.4.1.2.2 Abundance

The most abundant species recorded was *Asystasia gangetica* (25.4%) followed by *Swietenia macrophylla* (11%) and *Annona muricata* (9.3%) (Figure 9). The abundance of *A. gangetica* is expected since the Project site and adjacent areas are open-canopy grasslands where weeds and grasses grow in abundance. This species mostly dominates the understory vegetation in sampling areas. The mahogany trees (*S. macrophylla*) are mostly found along the southeast portion of the Project site along

the borders of pineapple plantations, which is mixed with a few narra trees (*P. indicus*). In the direct impact area, fruit trees dominate, such as soursop/guyabano (*A. muricata*) and cacao (*T. cacao*). Various pine tree species are also planted for ornamental purposes.

FIGURE 2-28. A BAR GRAPH SHOWING THE MOST ABUNDANCE FLORA SPECIES RECORDED WITHIN THE QUADRATS



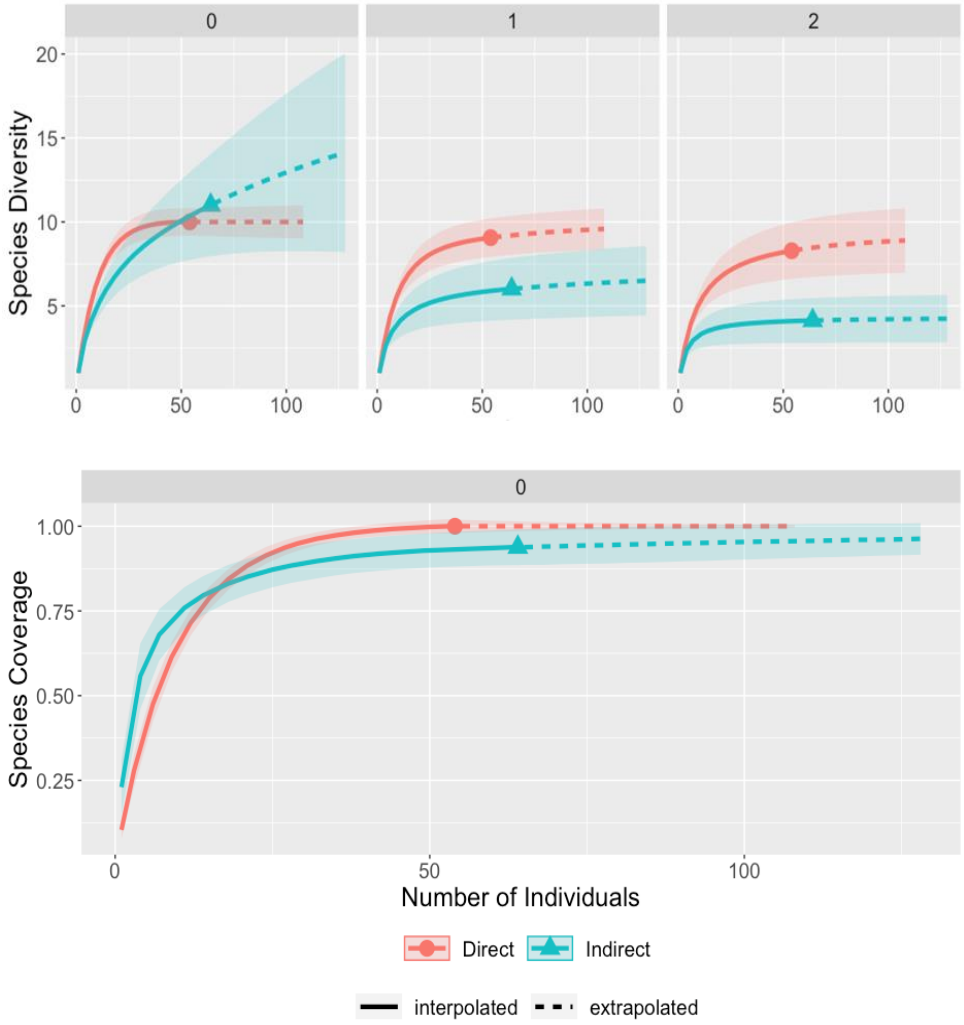
2.1.4.1.2.3 Floral Diversity

The sampling completeness curve shows that 100% and ~95% were respectively attained for direct and indirect impact areas (Figure 10, below figure), suggesting that the fieldwork is sufficient to characterize and compare diversity between these areas. Two measures of diversity (Shannon and Simpson) show that the direct impact area is significantly more diverse in floral composition (Shannon= 2.2, Simpson = 0.88) than the indirect impact area (Shannon= 1.79, Simpson = 0.76) (Figure 10, above figures 1 & 2), although the latter has more species recorded (Species Richness = 11) than the former (Species Richness = 10) (Figure 10, above figure 0).

FIGURE 2-29. Above: Individual-based rarefaction (solid line) and extrapolation curves (dotted line) for three common measures of diversity (q=0 is Species Richness, q=1 is Shannon Diversity, q=2 is Simpson diversity) with 95% confidence intervals (shaded areas) for the flora species recorded in and near the Project Area. The solid shapes

represent the reference samples. Below: Sample completeness curve denoting that sampling effort is sufficient (95-100% coverage attained).

The results suggest that the current site development plan within the direct impact area supported the higher diversity and may actually contribute to the maintenance of local biodiversity, although it should be noted that most species in the direct impact areas are ornamental and fruit trees (non-native). The lower diversity in the indirect



impact area is mostly the result of monocropping, as evinced by the large-scale plantation of pineapples in nearby areas. Only a few patches of trees are found nearby, and these are mostly confined along plantation borders. According to Fernando (1998), the diversity indexes of direct and indirect impact areas are considered low and very low, respectively. This is expected due to the history of agricultural monocropping, removing most of the native vegetation in the area. Despite the low Shannon diversity, high evenness values were computed for both direct (Eveness Index= 0.957) and indirect (Eveness Index= 0.748) impact areas, suggesting that no dominating plant species occur in sampling areas despite the low species count and abundance.

2.1.4.2 Terrestrial Fauna

2.1.4.2.1 Methodology

2.1.4.2.1.1 Field Sampling Methodology

A transect survey was employed to assess fauna in the direct and indirect impact areas of the Project. Six (6) 200-m transects were randomly established in the area, three (3) of which were within the direct impact area and another three (3) in the indirect impact area. Three persons traversed the six transects for two occasions at different time of day (8:00-10:00 and 3:00-4:00) to take into account temporal variations in species distribution. This was complemented by opportunistic sampling outside the transects through visual encounter survey, mist-netting, and pitfall trapping to maximize species list. Whenever possible, each fauna species recorded were photographed and identified to the lowest possible level using the available taxonomic literature and photographic guides. The threatened species were checked using the DENR Department Administrative Order 2019-05 and the IUCN Red List of Threatened Species. All species recorded were presented in the fauna checklist in Table 2-12.

TABLE 2-11. TRANSECT LOCATIONS FOR FAUNA SAMPLING

Transect No.	Start		End		Elevation (masl)
	Latitude	Longitude	Latitude	Longitude	
T1	6°22'53.71"N	124°58'48.80"E	6°22'58.29"N	124°58'44.22"E	295
T2	6°22'54.12"N	124°58'40.19"E	6°22'49.35"N	124°58'44.56"E	295
T3	6°22'57.20"N	124°58'52.60"E	6°23'1.85"N	124°58'48.11"E	294
T4	6°22'43.55"N	124°58'50.23"E	6°22'38.69"N	124°58'54.51"E	316
T5	6°22'38.69"N	124°58'59.84"E	6°22'34.19"N	124°58'55.20"E	326
T6	6°22'31.40"N	124°58'51.50"E	6°22'35.95"N	124°58'46.86"E	315

FIGURE 2-30. GOOGLE EARTH MAP SHOWING THE RELATIVE LOCATIONS OF TRANSECTS FOR FAUNA SAMPLING IN THE DIRECT (TRANSECT 1, TRANSECT 2, TRANSECT 3) AND INDIRECT (TRANSECT 4, TRANSECT 5, TRANSECT 6) IMPACT AREAS

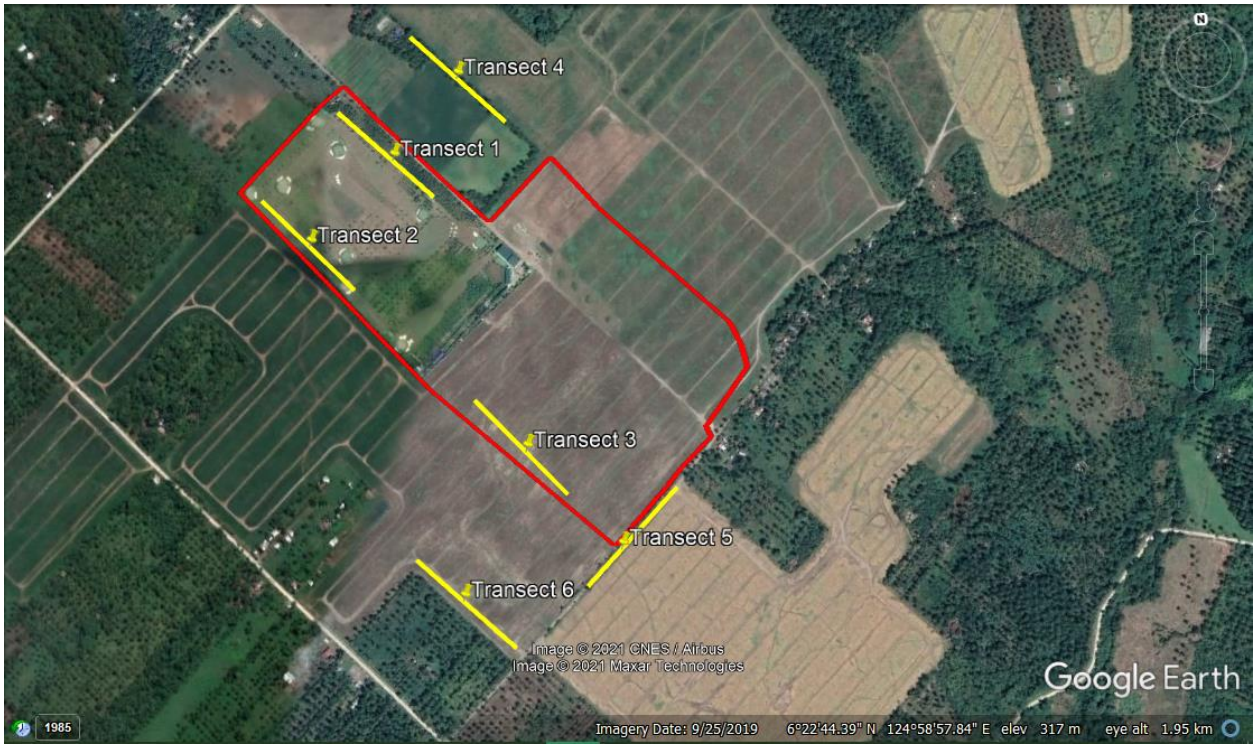


FIGURE 2-31. GEOTAGGED PHOTOS DURING THE TRANSECT SURVEYS / VISUAL ENCOUNTER SURVEYS IN THE DIRECT (LEFT) AND INDIRECT (RIGHT) IMPACT AREAS

FIGURE 2-32. SETTING UP OF MODIFIED PITFALL TRAPS (ABOVE) AND MIST NETS (BELOW)

2.1.4.1.2.3 Ecological Parameters (Statistical Analysis*)*

Sampling adequacy was examined using indiviudal-based rarefaction and extrapolation (R/E) curves and a sample completeness curve for the three most common measures of diversity: species richness, Shannon diversity, and Simpson diversity. These were computed and plotted with 95% confidence intervals in the R package *iNEXT* (Hsieh *et al*. 2016). A similar analysis was used to check for diversity of fauna between direct and indirect impact areas. The R/E curves help evaluate the

completeness of sampling and facilitate a conservative comparison of species richness between impact areas despite the differences in the sampling effort. Only those species observed in the transects were included in the analysis. We performed the analysis in the R statistical software Version 1.1.463 (R Core Team 2020). For the Evenness index, the value of Shannon diversity was divided by the natural logarithm (ln) of the species richness (Maguran, 1988).

2.1.4.1.2.4 Species List

A total of 25 fauna species from 21 families were inventoried, of which 16 species were birds, 7 species were reptiles, and 2 species were amphibians. Twenty (20) species were recorded in the direct impact area and 16 species in the indirect impact area.

There were 22 native species recorded, of which six (6) are Philippine endemic: *Collocalia troglodytes*, *Centropus viridis*, *Rhipidura nigritorquis*, *Draco cyanopterus, Eutropis* cf. *cuprea*, and *Sphenomorphus fasciatus.* Two (2) species identified were considered Invasive Alien Species, the amphibians *Rhinella marina* and *Kaloula pulchra.* For threatened status, two species were listed as Other Threatened Species (OTS) in the DAO 2019-09.

TABLE 2-12. LIST OF FAUNA SPECIES RECORDED DURING VEGETATION ASSESSMENT

No.	Family	Scientific Name	Common Name	IUCN	DAO 2019-05	Frequency
	BIRDS					
1	Accipitridae	*Haliaster indus indus*	Brahminy kite	LC	OWS	1
2	Alcedinidae	*Todiramphus chloris*	Collared Kingfisher	LC	OWS	7
3	Apodidae	*Collocalia troglodytes*	Pygmy swiftlet	LC	OWS	4
4	Artamidae	*Artamus leucorynchus*	White Breasted Woodswallow	LC	OWS	18
5	Columbidae	*Geopelia striata*	Zebra dove	LC	OWS	8
6	Corvidae	*Corvus macrorhynchos*	Larged-billed Crow	LC	OWS	42
7	Cuculidae	*Centropus viridis*	Philippine Coucal	LC	OWS	2
8	Estrildidae	*Lonchura atricapilla*	Chestnut munia	LC	OWS	39
9	Laniidae	*Lanius schach*	Long-tailed Shrike	NE	OWS	6
10	Locustellidae	*Megalurus palustris*	Striated Grass Bird	LC	OWS	23
11		*Cincloramphus timoriensis*	Tawny Grassbird	LC	OWS	1
12	Muscicapidae	*Saxicola caprata*	Pied Buschat	LC	OWS	44
13	Nectariniidae	*Cinnyris jugularis*	Olive-backed Sunbird	LC	OWS	14
14	Passeridae	*Passer montanus*	Eurasian tree sparrow	LC	OWS	57
15	Pycnonotidae	*Pycnonotus goiavier*	Yellow vented Bulbul	LC	OWS	5
16	Rhipiduridae	*Rhipidura nigritorquis*	Philippine Pied Fantail	LC	OWS	6

No.	Family	Scientific Name	Common Name	IUCN	DAO 2019-05	Frequency
	REPTILES & AMPHIBIANS					
17	Colubridae	*Coelognathus erythrurus*	Philippine Red-tailed Rat Snake	NE	OTS	1
18	Agamidae	*Draco cyanopterus*	Flying Lizard	LC	OWS	1
19	Gekkonidae	*Gekko gecko*	Tokay Gekko	NE	OTS	1
20		*Gehyra mutilata*	Stump-Toed Gekko	NE	OWS	6
21	Scincidae	*Eutropis multifasciata*	The Common Sun Skink	LC	OWS	8
22		*Eutropis* cf. *cuprea*	The Copper Sun Skink	DD	OWS	10
23		*Sphenomorphus fasciatus*	Banded Sphenomorphus	LC	OWS	1
24	Bufonidae	*Rhinella marina*	Cane Toad	NE	OWS	1
25	Microhylidae	*Kaloula pulchra*	Asiatic Painted Frog	LC	OWS	1

Note: NE = not evaluated, LC = least concern, OTS = Other Threatened Species; DD = Data Deficient; OWS= other wildlife species

FIGURE 2-33. *SAXICOLA CAPRATA* (LEFT; TRANSECT 4) AND *LANIUS SHACH* (RIGHT; TRANSECT 2)

FIGURE 2-34. *LONCHURA ATRICAPILLA* (LEFT; TRANSECT 3) AND *TODIRAMPHUS CHLORIS* (RIGHT; TRANSECT 1)

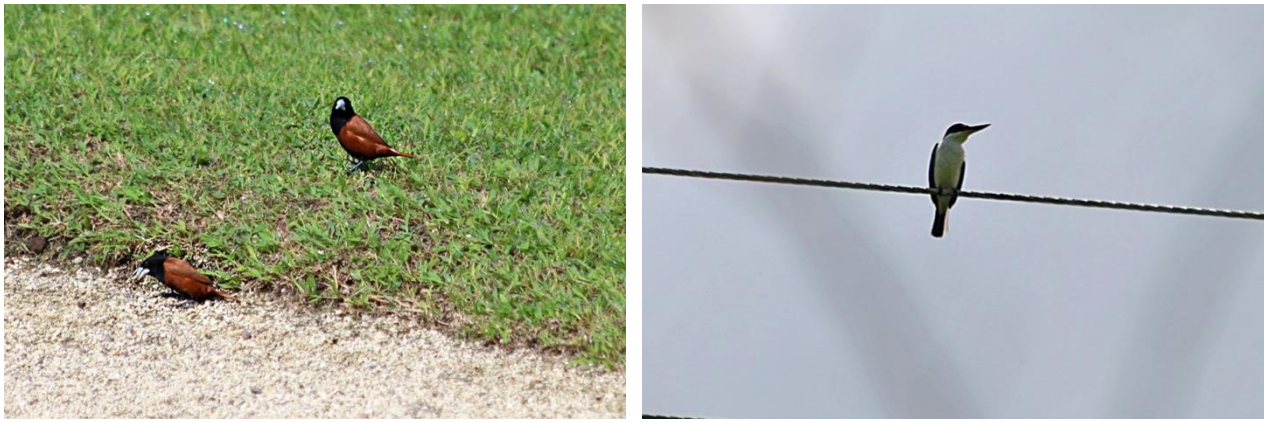


FIGURE 2-35. *MEGALURUS PALUSTRIS* (LEFT; TRANSECT 3) AND *PYCNONOTUS GOIAVIER* (RIGHT; TRANSECT 1)

FIGURE 2-36. *CINYRIS JUGULARIS* (LEFT; TRANSECT 1) *AND ARTAMUS LEUCORYNCHUS* (RIGHT; TRANSECT 5)

FIGURE 2-37. *CORVUS MACRORHYNCHOS* (LEFT; TRANSECT 2) AND *RHIPIDURA NIGRITORQUIS* (RIGHT; TRANSECT 1)

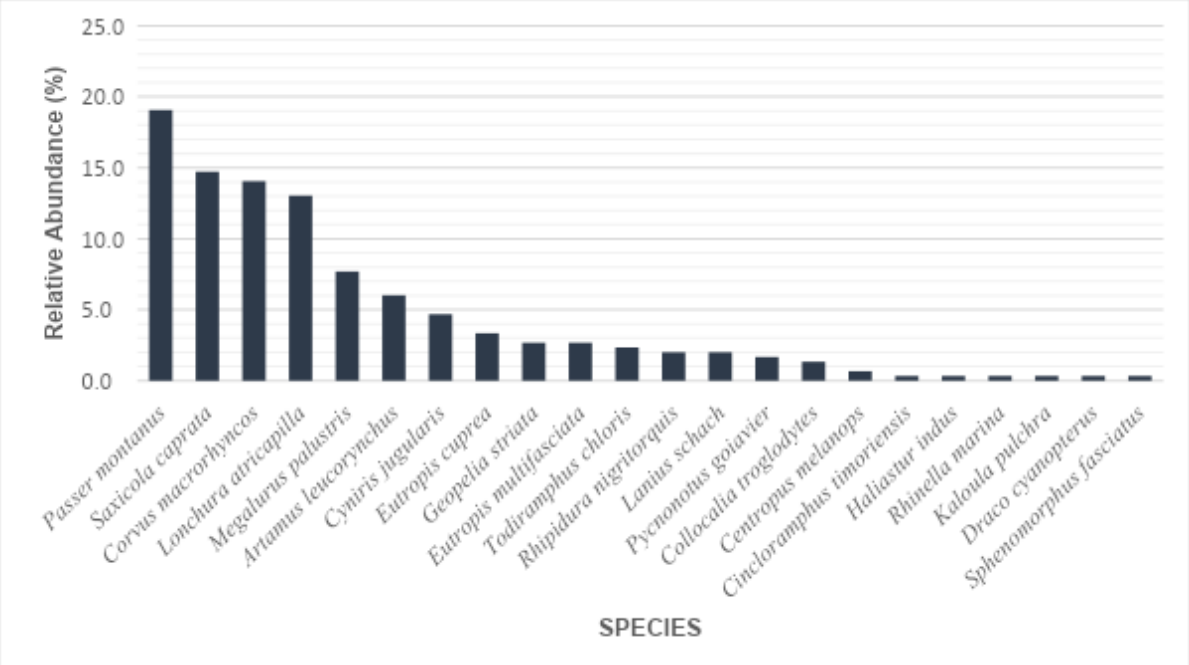

FIGURE 2-38. *DRACO CYANOPTERUS (LEFT; TRANSECT 5) AND SPHENOMORPHUS FASCIATUS (RIGHT; TRANSECT 1) CAUGHT IN PITFALL TRAP*


FIGURE 2-39. *EUTROPIS CUPREA (LEFT; TRANSECT 5) AND EUTROPIS MULTIFASCIATA (RIGHT; TRANSECT 1)*


2.1.4.1.2.5 Abundance

The most abundant species recorded was the cosmopolitan species *Passer montanus* (19.1%) or locally known as maya, followed by *Saxicola caprata* (14.7%), *Corvus macrorhyncos* (14%), and *Lonchura atricapilla* (13%) (Figure 18). These bird species are most common and abundant in open canopy habitats, such as the Project site. They occur in disturbed areas and have a wide tolerance to disturbance. These species occur both in the direct and indirect impact areas, although the corvid *C. macrorhyncos* was mostly observed in the golf course. This may be the reason why only a few reptiles were seen in direct impact area because they are vulnerable to predation and there is relatively less cover. However, avian fauna mostly dominated during the transect surveys.

FIGURE 2-40. A BAR GRAPH SHOWING THE MOST ABUNDANT FAUNA SPECIES RECORDED WITHIN THE TRANSECTS

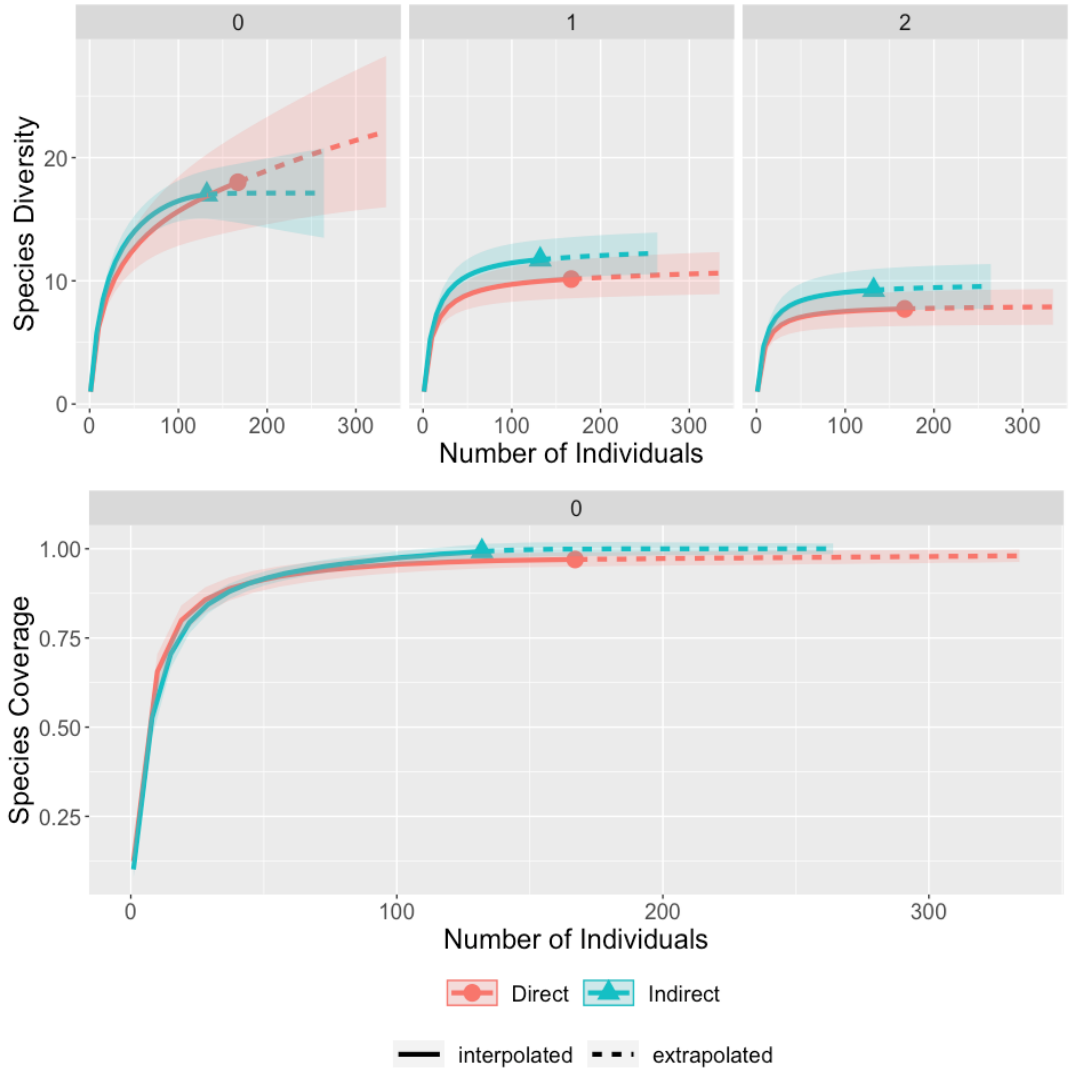


2.1.4.1.2.6 Faunal Diversity

The sampling completeness curve shows that almost 100% were attained for both direct and indirect impact areas (Figure 2-38, below figure), suggesting that the fieldwork is sufficient to characterize and compare diversity between these areas. Two measures of diversity show that the indirect impact area is more diverse in faunal composition (Shannon= 2.53, Simpson = 0.89) than the direct impact area (Shannon= 2.4, Simpson = 0.88) (Figure 2-38, above figures 1& 2), although the latter has more species recorded (Species Richness = 18) than the former (Species Richness = 17) (Figure 2-38, above figure 0). However, these results were statistically not significant, suggesting no meaningful difference in diversity can be concluded between impact areas.

FIGURE 2-41. ABOVE: INDIVIDUAL-BASED RAREFACTION (SOLID LINE) AND EXTRAPOLATION CURVES (DOTTED LINE) FOR THREE COMMON MEASURES OF DIVERSITY

(Q=0 IS SPECIES RICHNESS, Q=1 IS SHANNON DIVERSITY, Q=2 IS SIMPSON DIVERSITY) WITH 95% CONFIDENCE INTERVALS (SHADED AREAS) FOR THE FAUNA SPECIES RECORDED IN AND NEAR THE PROJECT AREA. THE SOLID SHAPES REPRESENT THE REFERENCE SAMPLES. BELOW: SAMPLE COMPLETENESS CURVE DENOTING THAT SAMPLING EFFORT IS SUFFICIENT (ALMOST 100% COVERAGE ATTAINED)



The results suggest that both the direct and indirect impact areas host almost similar levels of faunal diversity (no significant difference of the faunal diversity between impact areas). The faunal composition and diversity recorded are typical of an open-canopy and human-altered landscape. All fauna species recorded between impact areas can tolerate a varying degree of anthropogenic disturbance, thus most species seen outside the Project site have been also recorded inside, suggesting that the development has no substantial negative impacts on the local faunal biodiversity as the data suggest. There were also no dominating species in between the impact areas as evinced by the high Evenness index for both direct (0.83) and indirect (0.89) impact areas. The Project site harbors a diverse microhabitat enough to support different feeding guilds of avian fauna which contributed to the high diversity estimate, such as nectarivores (*C. jugularis*), omnivores (*C. macrorhynchos*),

insectivores (*S. caprata*), graminivores (*L. atricapilla*), carnivores (*T. chloris*), and frugivores (*P. goiavier*).

2.1.4.3 Impact Assessment

The key impacts on terrestrial biodiversity vis-à-vis project-related activities are herein discussed. Since the golf course has already been established and portions of which are still under development, this report focuses on possible factors stemming from these activities that threaten existing local biodiversity.

2.1.4.3.1 Vegetation removal and habitat loss

The construction of golf course entailed the removal of vegetation in the direct impact area, but the floral diversity data gathered from the indirect impact area suggest that pre-construction vegetation was not significantly more diverse, which could be due to the presence of large-scale agricultural plots. Prior to the construction of the golf course, the vegetation of the area was open canopy shrubland and grassland and do not significantly differ from its present state. To maintain and even improve local floral biodiversity in the direct impact area, polyculture should be continually implemented to provide additional habitats for other flora and fauna species to inhabit. This practice is somehow evident within the golf course (direct impact area) since it supported a diverse avian species from different feeding guilds, increasing its diversity estimate.

2.1.4.3.2 Threat to existence and/or loss of important species

Since the golf course has already been established, the native flora species that were removed in the process could not be determined. However, based on the data gathered from the indirect impact area, the native species taro (*C. esculenta*), alim (*M. multiglandulosa*), narra (*P. indicus*), and the fern *A. heraclea* may have been present previously in the direct impact area. The latter two species are considered threatened in the Philippine Red List. These species, however, are widespread in the Philippines and are adapted to areas with a varying degree of disturbances. As part of the ongoing development in the Project site, the aforementioned native species could be planted inside the direct impact area to partially imitate the pre-construction vegetation. Moreover, there have been no imminent threats to the local fauna in the area since the faunal diversity estimates between impact areas are almost similar, which suggests that faunal species could persist and still reproduce in the types of habitats present in and near the Project site. All faunal species recorded are considered habitat generalists and can tolerate a wide range of anthropogenic disturbance.

Threat to abundance, frequency, and distribution of species

Based on both Shannon and Simpson diversity indexes, the direct impact area shows a richer floral diversity than the indirect impact area. The results suggest that the

former support local floral diversity, particularly in terms of species richness and abundance. The practice of polyculture in the direct impact area has allowed for the many understory flora species to colonize, supporting floral diversity within the Project site. Since the ongoing developments are confined within the Project site, no adverse impacts on abundance, frequency, and distribution of floral species are identified. The two threatened species recorded, *A. heraclea* and *P. indicus,* are found in the indirect impact areas, hence are not affected by ongoing developments. The former was recorded 140-m away from the northern border of the Project, while the latter species were planted 5-m from the southeastern border. To enhance local biodiversity and support conservation, these two threatened species could be planted inside the direct impact area. Moreover, the vegetation within the Project site supported a diverse fauna, particularly birds. These are habitat generalists and can freely move in between impact areas since there are no barriers to wildlife movement that were identified. The diversity estimates for fauna in the Project site also show that abundance and frequency, which are considered for the computations of both Shannon and Simpson indexes, do not significantly differ from what was recorded outside of the Project site.

2.2 Water

2.2.1 Hydrology/Hydrogeology

2.2.1.1 Drainage Morphology

Located at the foot of the Mount Matutum, a large portion of the municipality of Tupi makes up a significant portion of the Mount Matutum Protected Landscape and its corresponding watershed area. There are three (3) identified tributaries in the locality of Barangay Linan where the golf course project is situated. Primarily, the Cabizares Creek is the nearest waterbody to the project site, while Marbel River (Lote South), and Linan River are also situated in the barangay.

The three freshwater streams originated from the headwater in Mount Matutum, and flow downstream until the creeks converge with Palian River which drains to Lake Buluan in Lutayan, Sultan Kudarat. The watershed areas of the creeks are relatively small.

2.2.1.2 Water Resources

Surface Water

As mentioned, there are three identified streams or creeks in Barangay Linan – Linan River, Marbel River, and Cabizares River. The locations of the three surface waterbodies are not within the boundaries of the project area, however, they are sufficiently near to be part of the project's impact area. The streams have water flowing all throughout the year. All three discharge downstream towards Palian River.

Groundwater

Inside the project area, there is a single groundwater source, tapped using electric pump, utilizing fourteen 20-ft pipes, and supplies water to specific purposes within the golf course, such as irrigation, domestic use, and for filling the swimming pools within the project area.

Wells

There are no existing or proposed deep wells within the project site. The area is at a sufficiently high elevation, and the water table is considerably hard to reach using the economical number of water pipes.

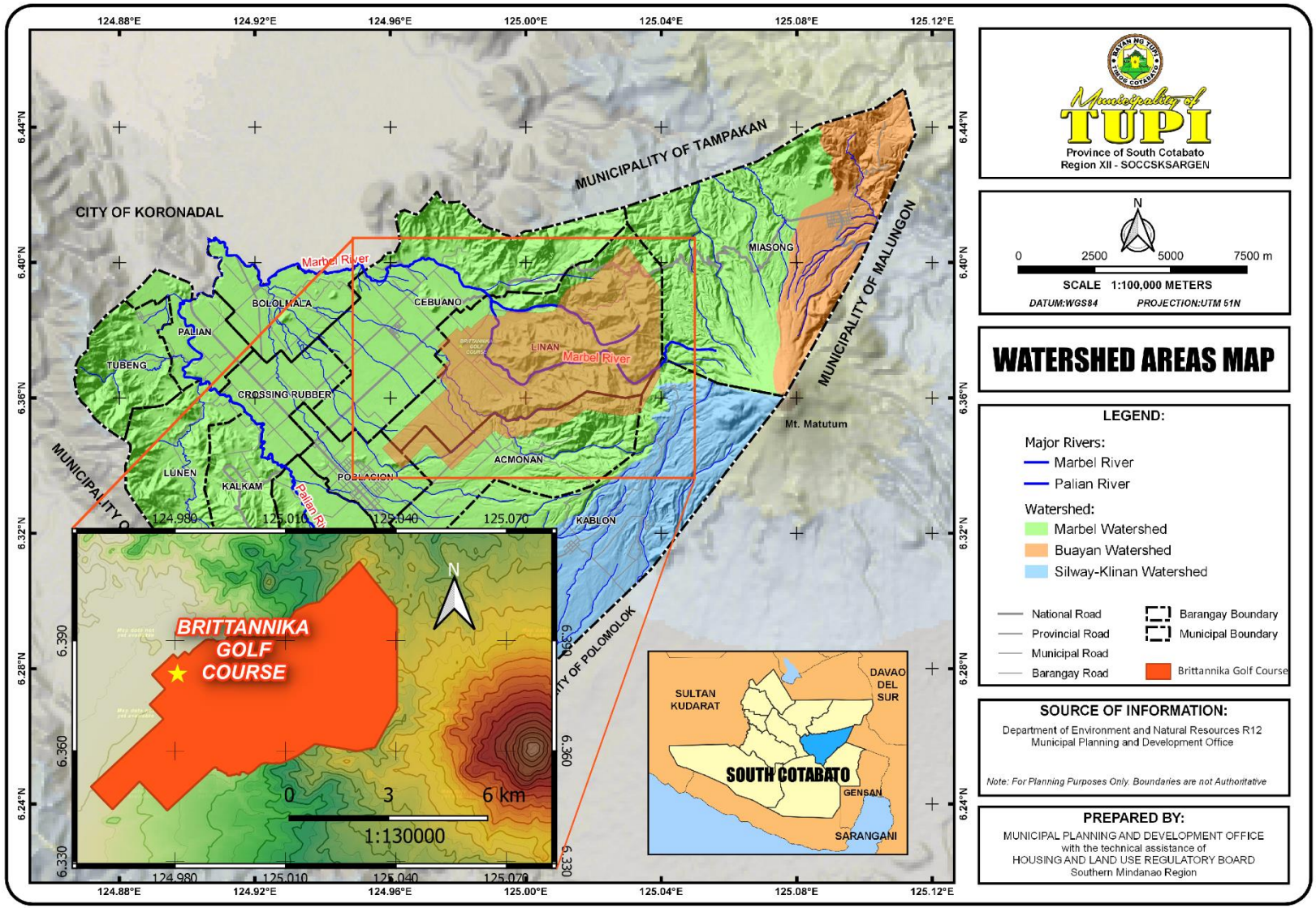
2.2.1.3 Impact Assessment on Hydrology

Change in drainage morphology and depletion of water resources

Since the project will adopt an effective and comprehensive irrigation system that is fundamental to its operation, the project is not expected to cause floods or diminish stream volumetric flow. The irrigation system will be able to direct and store rain surface runoff, which will be used to meet the golf course's daily water needs.

Domestic water for the club house will be supplied by the groundwater from the existing pump within the project site. The installation of additional groundwater pump is not proposed or foreseen.

FIGURE 2-42. WATERSHED MAP SHOWING THE PROJECT SITE



Brittannika Golf Course

Purok Pag-asa, Barangay Linan, Tupi, South Cotabato

2.2.2 Water Quality

The data of the water quality baseline sampling conducted last June 3, 2021 are presented in this section. The vicinity of the area is first surveyed to locate potential water sampling station locations. The nearby freshwater bodies in the project area were the focus of the water quality assessment.

2.2.2.1 Methodology

Two (2) surface water samples and two (2) groundwater samples were obtained from sampling sites strategically placed throughout and adjacent to the project area. Primary water quality parameters such as color, pH, dissolved oxygen (DO), biochemical oxygen demand (BOD), total suspended solids (TSS), temperature, phosphate, nitrate as NO_3-N, chloride, and, fecal coliform, alongside secondary parameters like oil and grease, hexavalent chromium (Cr^{+6}), lead (Pb), organochlorine and organophosphate pesticides were among the determinates. All water samples were brought to the DENR-EMB Regional Environmental Laboratory 12, and Ostrea Mineral Laboratories, Inc., a DENR-recognized third-party laboratory for analysis of various water quality parameters.

Coordinates for the established sampling stations are shown in Table 2-13. The corresponding map is presented in Figure 2-41. Photo documentation of water sampling is presented in Figure 2-40.

TABLE 2-13. GEOGRAPHICAL COORDINATES OF WATER SAMPLING STATIONS

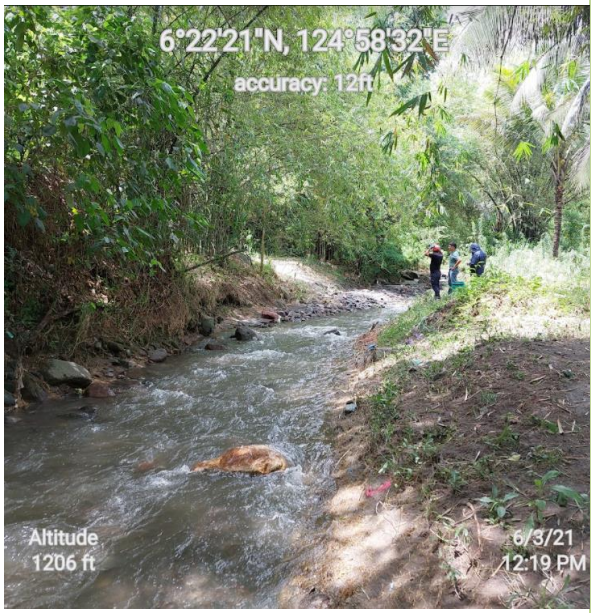
STATION	SAMPLE TYPE	LOCATION	COORDINATES	
			LATITUDE	LONGITUDE
1	Groundwater	Javier Residence, Prk. Cabatuan, Brgy. Cebuano	6.386389	124.979167
2	Groundwater	Brittannika Golf Course Compound, Brgy. Linan	6.382778	124.978889
3	Surface Water	Cabizares Creek (Upstream)	6.3725	124.975556
4	Surface Water	Cabizares Creek (Downstream)	6.376389	124.96944

The current situation of surface and groundwater quality in the study region was assessed using the standards outlined in DENR Administrative Order (DAO) No. 2016-08 – Water Quality Guidelines and General Effluent Standards of 2016, as well as updates on certain water quality parameters in DAO No. 2021-19.

FIGURE 2-43. CONDUCT OF WATER SAMPLING

(A) Water sampling at Station 1

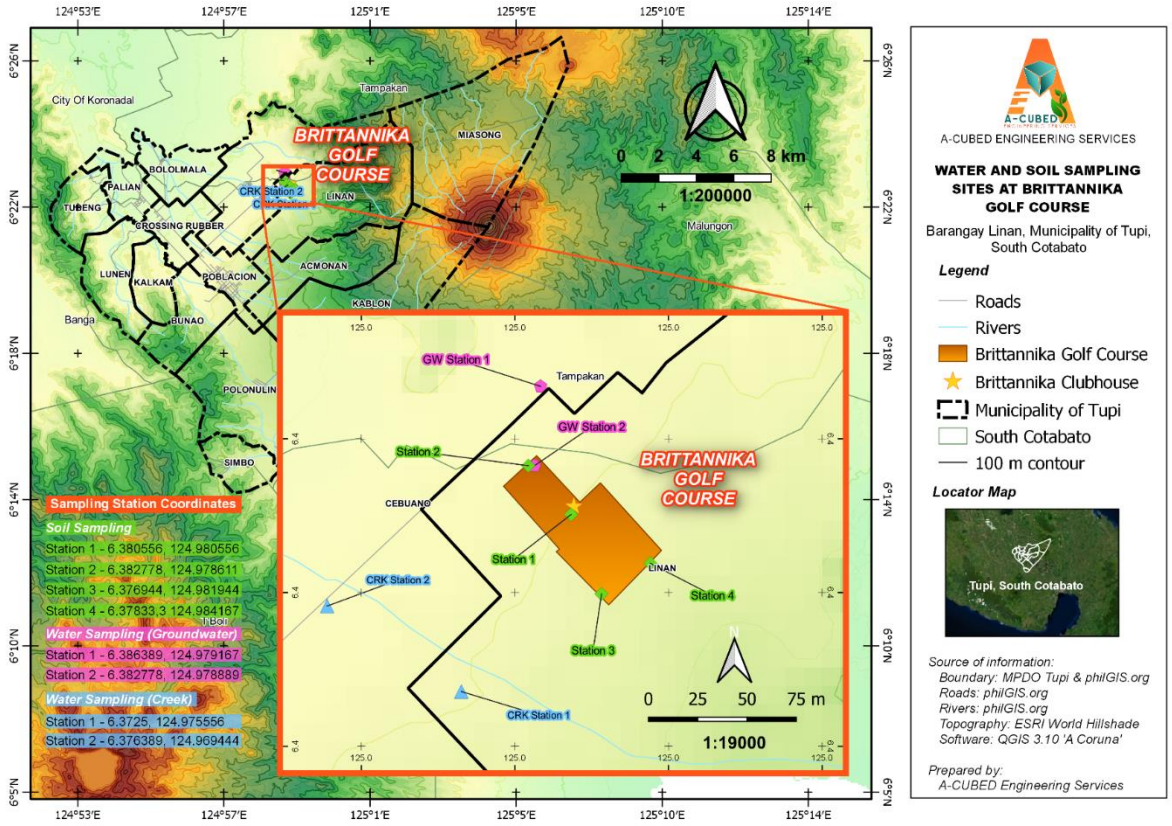
(B) Water sampling at Station 2



(C) Water sampling at Station 3

(D) Water sampling at Station 4

FIGURE 2-44. WATER SAMPLING MAP



2.2.2.2 Results

The freshwater within the project area, based on the current beneficial usage can be categorized as Class C, which is suitable for non-contact recreational activities and for agriculture irrigation and livestock watering, according to DAO No. 2016-08.

The groundwater, however, is classified as Class A (Public Water Supply Class II), since it is habitually used for domestic uses, and must at least meet the latest Philippine National Standards for Drinking Water (PNSDW) set by the Department of Health (DOH).

The results for the water quality assessment, as presented in Table 2-14, showed that almost all of the values for the parameters tested were within the standard values set by the DENR, with a few exceptions in fecal coliform, temperature, oil and grease, and phosphates. The following section discusses the relevant parameters and their impacts to the water quality.

2.2.2.2.1 Color

When the levels of decaying organic matter, as well as dissolved metals such as manganese and iron are high, the color of a waterbody is affected. Although it only impacts the water quality visually, related factors may be considered when there is unusual color in the waterbody. For the four stations, all color values were within their corresponding DENR standards.

2.2.2.2.2 pH

The pH is a measure of the hydrogen ions dissociated in water, which corresponds to the acidity. In the case of surface waters, unfavorable effects may be observed when pH levels exceed 9.0 or dip below 6.5 for Class C waterbodies. Beyond this range, the growth and survival of aquatic organisms are usually compromised. For groundwater, allowable pH values range from 6.5 to 8.5.

The results of the analysis showed that pH levels for all four stations were within their respective threshold ranges.

2.2.2.2.3 Dissolved Oxygen (DO)

The amount of gaseous oxygen dissolved in water is also vital particularly in freshwater where a number of organisms thrive. Dissolved oxygen is one of the parameters that is used to determine if the waterbody is still healthy. In the case of the four sampling stations monitored, all of them were sufficiently above the 5 mg/L concentration.

2.2.2.2.4 Biochemical Oxygen Demand (BOD)

BOD is a common measure of the amount of available oxygen to be used by microorganisms in the water in order to decompose the pollutants present. In this regard, the higher demand of oxygen indicates the large number of microorganisms present, and translates to a more polluted water. BOD levels for the four stations were only limited to 1mg/L, which shows that the water is not contaminated by organic pollutants.

2.2.2.2.5 Total Suspended Solids (TSS)

Suspended solids are pollutants which can be caused naturally or induced by anthropogenic activities. They are solids that do not settle, and cause turbid waters which significantly decrease oxygen levels and increase temperatures since they

block a portion of the sunlight from entering into the waters. In the case of the water sampling conducted, no significant levels of TSS were recorded in all four stations, only peaking at 41 mg/L at the upstream portion of Cabizares Creek (Station 4).

2.2.2.2.6 Temperature

The internal temperature affects the processes and kinetics involved in the water and the organisms that thrive in it. In most cases, temperature is a significant factor in the rate of photosynthesis by aquatic plants, the amount of dissolved oxygen in water, and even the metabolism and biological processes in aquatic fauna.

In situ readings for the temperature of all stations did not meet the minimum limit for their corresponding classifications. With deficits of about 2^{o}C for the stations, the slightly lower water temperature readings were affected by several factors, such as weather, ambient air temperature at the time of sampling, the elevation of the location, and the depth of source for the groundwater samples.

2.2.2.2.7 Phosphate

The presence of phosphates in water at a high concentration may lead to the excessive growth of algae. Most of the time, runoffs that contain phosphate residues from agricultural inputs may end up polluting surface water bodies. In the same case, some of the pesticide residues may seep into the ground and percolate the water table. In an ecological sense, high phosphate levels may lead into oxygen depletion and eutrophication.

Phosphate levels in both groundwater and river water samples exceeded the updated water quality guidelines in DAO 2021-19. Ranging from 0.247 to 0.471 mg/L, the phosphate levels in the four samples ended up about 10 to 20 times higher than the DENR standard for phosphate which is only at 0.025 mg/L. The presence of vast fields of pineapple plantation in the vicinity potentially contributed to the high phosphate levels in the water, as a multitude of fertilizers, pesticides, herbicides and other soil conditions are being applied, and the inorganic residues are being washed by rain into the nearby Cabizares Creek or down underground.

2.2.2.2.8 Nitrate as NO_3-N

Normal levels of nitrate in water do not have a significant impact to the aquatic organisms. Yet, unusually excessive concentrations may disrupt the ecological balance as nitrates promote plant growth, which may be deemed disadvantageous if left uncontrolled. Similar to phosphates, agricultural inputs are one of the major sources of anthropogenic nitrates. However, for all of the sampling stations, the concentrations of nitrate did not exceed the 7 mg/L standard.

2.2.2.2.9 Chloride

Chlorides might be introduced to the water naturally or through anthropogenic activities such as agricultural runoffs, or improperly discharged wastewater. When chloride levels reach abnormally high, groundwater potability may be severely affected, and can cause death to aquatic organism in freshwater. Chloride levels for the surface and groundwater samples for the four stations remain compliant to their corresponding DENR standards.

2.2.2.2.10 Fecal Coliform

As a group of indicator bacteria, fecal coliform is very crucial in determining the presence of fecal contamination in water, and the accompanying pathogenic microorganism. Surface waters are exposed to several sources of coliforms, particularly from households near the river banks, wastes from human and animals, and also those present naturally in soil that is washed off by rain into the stream.

Fecal coliform levels for both stations for ambient water exceeded the maximum threshold for Class C waterbodies. With values as high as 7900 and 13000 MPN/100mL for Stations 3 and 4 respectively, the fecal coliform can be traced back to the presence of farm lands and rearing of farm animals near the creek. On one side of the creek is a slightly downhill terrain, hence, the waterbody serves as a catchment for upland runoffs during rainy season which include a multitude of pollutants including animal wastes. Meanwhile, both groundwater samples passed the criterion for Class A, however, did not meet the maximum allowable fecal coliform under PNSDW. Both stations have detectable fecal coliform counts of 1.8 MPN/100mL, marginally exceeding the 1.1 MPN/100mL standard.

2.2.2.2.11 Oil and Grease

When oil and grease residues from domestic and industrial uses are deposited in surface or ground waters, it can produce surface films and deposits, causing environmental degradation and posing a danger to human health. Furthermore, oil and grease has the potential to disrupt aerobic and anaerobic biological processes, and impede the photosynthesis of aquatic plants.

As high as 5.0 mg/L of oil and grease were recorded in Station 2, and all except for Station 4 exceeded the DENR standards for oil and grease. Kitchen wastes that are improperly managed from households nearby can potentially introduce oil and grease residues in the water.

2.2.2.2.12 Lead

As one of the toxic heavy metals, the introduction of lead into the water particularly in groundwater is considered very detrimental as it may lead into a multitude of adverse impacts in organisms' central nervous and reproductive systems. Lead may also bioaccumulate and biomagnify as it enters the food chain. Lead concentrations in the four sampling stations were barely detectable, and do not pose any risks to the nearby population.

2.2.2.2.13 Hexavalent Chromium (Cr^{6+})

Naturally, chromium is found primarily in two forms: trivalent chromium (Cr^{3+}) which is an essential human nutrient, and hexavalent chromium (Cr^{6+}), which is toxic to organisms. For humans, hexavalent chromium is a carcinogen and a reproductive toxin. For the sampling conducted in the four established stations, hexavalent chromium levels were barely detectable.

2.2.2.2.14 Pesticide Residues

Pesticide is a broad term that refers to any substance or chemical that is used to kill or control pests such as weeds, fungi, insects, and other unwanted organisms. Residues from the pesticides may reach the nearby surface and groundwater through runoffs and leaching, which may pose hazards to the aquatic organisms and humans. Organochlorine and organophosphate pesticides are usually employed in most

agricultural applications due to their efficacy and availability, but improperly managed use may be deemed detrimental. A multitude of pesticide classes were tested for their presence in the four water sampling points, and all of the them showed no traces of both organophosphate and organochlorine pesticides.

TABLE 2-14 REULTS OF WATER SAMPLING

PARAMETER	UNIT	TEST METHOD	GROUNDWATER		CLASS A STANDARD	PNSDW	SURFACE WATER		CLASS B STANDARD
			STN 1	*STN 2*			*STN 3*	*STN 4*	
Color	CU	Platinum-Cobalt Visual Comparison Method	5	5	50	10	15	15	50
pH	-	Electrometric	6.51	7.07	6.5 – 8.5	6.5 – 8.5	7.75	8.06	6.5 – 9.0
Dissolved Oxygen (DO)	mg/L	Modified Winkler	5.1	5.7	*5 (min)*		5.7	6.0	5
Biochemical Oxygen Demand (BOD)	mg/L	Azide Verification Winkler	1	1	3		1	<1	7
Total Suspended Solids (TSS)	mg/L	Gravimetry	12	<3	50		41	35	80
Temperature	°C	Electrometric	23.0	22.7	26-30		23.0	22.8	25 – 31
Phosphate	mg/L	Ion Chromatography	0.471	0.365	0.025		0.247	0.253	0.025
Nitrate as NO_3-N	mg/L	Ion Chromatography	<1	6.076	7	50	4.213	3.812	7
Chloride	mg/L	Ion Chromatography	20.18	14.89	250	250	8.942	8.044	250
Oil and Grease	mg/L	Liquid-Liquid, Partition	1.4	5.0	1		1.9	0.9	3

		Gravimetric Method							
Fecal Coliform	MPN/ 100mL	Multiple Tube Fermentation Technique	1.8	1.8	50	<1.1	7900	13000	200
Hexavalent Chromium (Cr^{+6})	mg/L	Colorimetric	<0.01	<0.01	0.01		<0.01	<0.01	0.01
Lead (Pb)	mg/L	Direct Air-Acetylene Flame	<0.01	<0.01	0.01	0.01	<0.01	<0.01	0.05
Organochlorine Pesticides		Gas Chromatography							
Alpha-Lindane	µg/L		<0.01	<0.01	2	2	<0.01	<0.01	
Gamma-Lindane	µg/L		<0.02	<0.02	2	2	<0.02	<0.02	
Beta-Lindane	mg/L		<0.00002	<0.00002	2	2	<0.00002	<0.00002	
Delta-Lindane	µg/L		<0.01	<0.01	2	2	<0.01	<0.01	
Heptachlor	µg/L		<0.01	<0.01	0.03		<0.01	<0.01	
Aldrin	mg/L		<0.00002	<0.00002	0.02	0.00003	<0.00002	<0.00002	
Heptachlor epoxide	µg/L		<0.06	<0.06			<0.06	<0.06	
trans-Chlordane	mg/L		<0.00001	<0.00001	0.2	0.0002	<0.00001	<0.00001	
cis-Chlordane	mg/L		<0.000002	<0.000002	0.2	0.0002	<0.000002	<0.000002	
Endosulfan I	µg/L		<0.07	<0.07			<0.07	<0.07	
4-4'-DDE	µg/L		<0.07	<0.07			<0.07	<0.07	

Dieldrin	mg/L		<0.00001	<0.00001	0.00003	0.00003	<0.00001	<0.00001	
Endrin	mg/L		<0.00002	<0.00002	0.0006	0.0006	<0.00002	<0.00002	
4,4'-DDD	µg/L		<0.07	<0.07			<0.07	<0.07	
Endosulfan II	µg/L		<0.06	<0.06			<0.06	<0.06	
Endrin aldehyde	µg/L		<0.02	<0.02			<0.02	<0.02	
4,4'-DDT	mg/L		<0.00003	<0.00003	0.001		<0.00003	<0.00003	
Endosulfan sulfate	µg/L		<0.08	<0.08			<0.08	<0.08	
Methoxychlor	µg/L		<0.02	<0.02	50		<0.02	<0.02	
Endrin-ketone	µg/L		<0.03	<0.03			<0.03	<0.03	
Toxaphene	µg/L		<0.073	<0.073	4		<0.073	<0.073	
Organophosphate Pesticides		Gas Chromatography							
Methamidophos	µg/L		<0.5	<0.5			<0.5	<0.5	
Dichlorvos	µg/L		<0.5	<0.5			<0.5	<0.5	
Omethoate	µg/L		<0.5	<0.5			<0.5	<0.5	
Demeton-S-methyl	µg/L		<0.5	<0.5			<0.5	<0.5	
Dimethoate	µg/L		<0.5	<0.5			<0.5	<0.5	
Tolclofos-methyl	µg/L		<0.5	<0.5			<0.5	<0.5	
Pirimiphos-methyl	µg/L		<0.5	<0.5			<0.5	<0.5	

Malathion	µg/L		<0.5	<0.5	1		<0.5	<0.5	3
Chlorpyrifos	µg/L		<0.5	<0.5			<0.5	<0.5	
Methidathion	µg/L		<0.5	<0.5			<0.5	<0.5	
Prothiofos	µg/L		<0.5	<0.5			<0.5	<0.5	
Profenofos	µg/L		<0.5	<0.5			<0.5	<0.5	
Ethion	µg/L		<0.5	<0.5			<0.5	<0.5	
Azinphos-methyl	µg/L		<0.5	<0.5			<0.5	<0.5	
Pyrazophos	µg/L		<0.5	<0.5			<0.5	<0.5	

2.2.2.3 Impact Assessment on Water Quality

Degradation of Water Quality (Groundwater and Surface Water)

One of the major concerns of establishing a golf course project is the potential contamination of nearby surface and groundwater sources due to the residues from agricultural inputs being utilized to maintain the turf and greens. Primarily, excess fertilizers and pesticides may contribute to the increase in nitrate, phosphate, and chloride levels in the water.

During the construction and pre-operation phase, the turfs and greens are still being grown into maturity, and require substantially higher amounts of nitrogen from fertilizers. If not properly managed, overapplication may occur and excess nitrogen can be carried by run-off into nearby waterways and nitrate buildup will be detrimental.

For the operation phase, the amount of agricultural inputs will be reduced since the grasses are already established and mature. However, the situation is still analogous with the construction phase, as in-depth fertilizer and pesticide management is still highly required in order to avoid or at least mitigate the pollution of both surface and groundwater.

As discussed in the previous sections, phosphates and nitrates are already elevated due to the presence of vast agricultural lands which are also using several agricultural inputs. If not properly addressed, the operation of the golf course may possibly contribute to the imbalance of the nutrients in the water.

Hence, to alleviate these potential impacts of fertilizer and pesticide use to the status of water quality of the nearby surface and groundwater sources, the proper schedule and optimal application of fertilizers and pesticides for the greens in the golf course will be carried out. A project agronomist will be assigned to plan and supervise the proper management of the inputs, such that excessive application of the chemicals will be prevented.

Aside from the threats to water quality arising from the application of fertilizers and pesticides, the effects of generation of wastewater from the construction and operation are also considered.

A huge part of the construction phase is the shaping of the landscape which entails the excavation and filling of land. Soil and sediment runoff from the activity can lead to elevated levels of suspended solids and turbidity in receiving water bodies. Although sediments are not the usual type of pollution since they are not biological or chemical contaminants, large areas of disturbed lands due to construction activities can still significantly impair water quality if not properly mitigated. Also, potential elevation in pH levels may occur due to contamination with high pH chemicals like concrete products, or limestone.

In order to address this issue, a storm water management plan which include silt fences, vegetative buffers, construction, inlet protection, and site stabilization may be employed to reduce the generation of pollutants and impede the transport of these pollutants into surface waters.

Usual activities such as cooking, eating, washing of vehicles and equipment, and use of toilets, will all generate wastewater. The wastewater may contain several pollutants such as organic wastes, oil and grease, suspended solids and pathogenic

microorganisms that may pollute both surface and groundwater if not properly treated.

Blackwater will be directed into the network of pipes draining into the septic tanks which will hold and treat the wastes, and will be regularly desludged. Greywater will be treated at the STP/reed bed wherein the treated effluent will be utilized as an additional irrigation water of the golf course.

Further, regular water sampling activities will be carried out in order to monitor the trend of the primary water quality parameters, such that immediate and appropriate actions can be done to mitigate any potential damage to the environment.

2.2.3 Aquatic Ecology

No fishing activities are significantly carried out in Cabizares Creek, as the streamflow is characteristically shallow, and very sparse fish species can be observed in the waterbody.

Baseline assessment of the freshwater ecology was conducted in selected areas of Cabizares Creek that is in proximity to the project site. Samples were collected using 64-micron plankton net, and were properly preserved using 5 v/v% formaldehyde, and sent to ORCA laboratory for analysis and determination. By observing under the aid of magnification through microscope and the Sedgewick chamber for counting, the enumeration of plankton species was carried out.

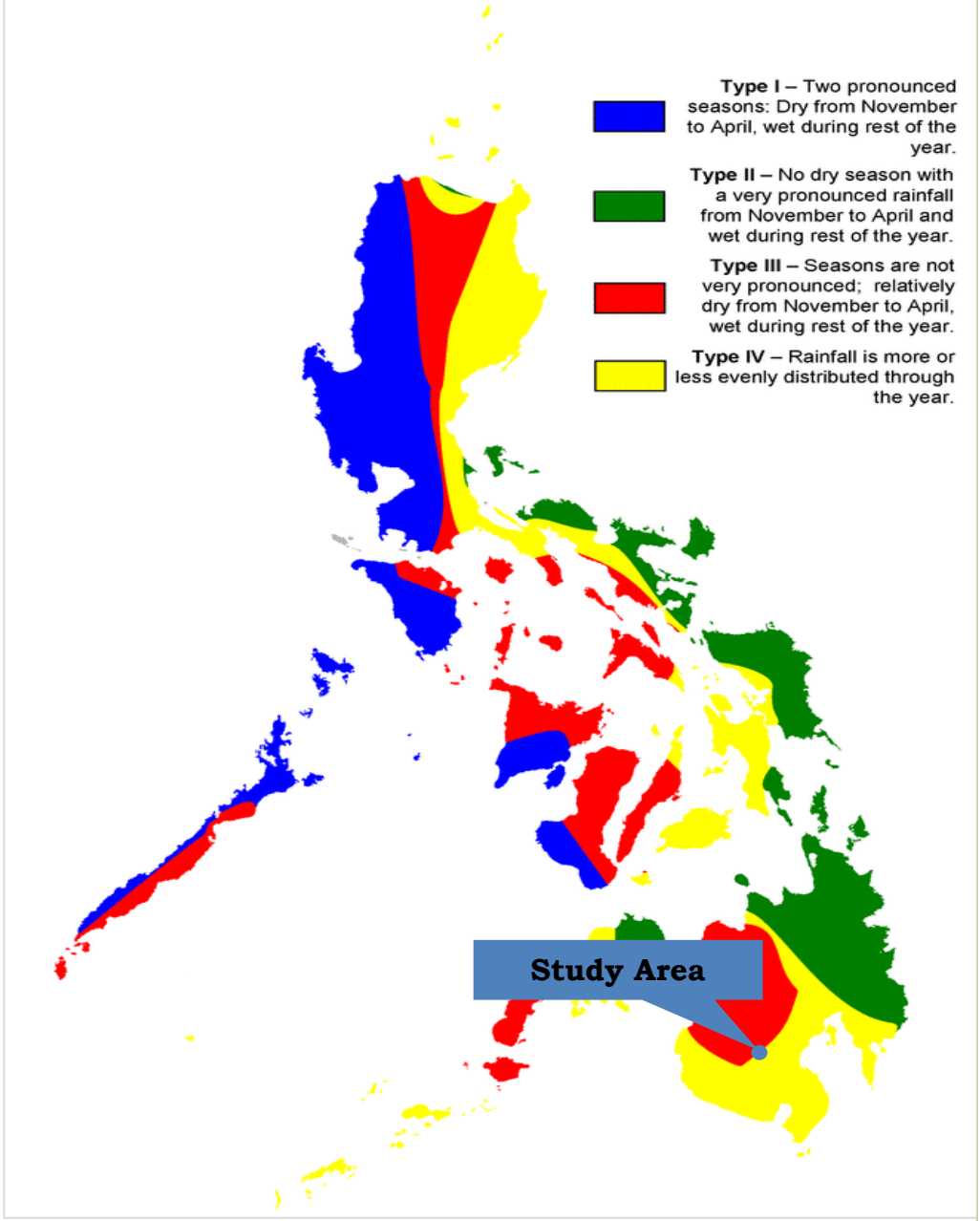
Among the phytoplankton found in the stream, green algae (*Chlorophyta*) and diatoms (*Bacillariophyta*) were found the most abundant at 72.3% and 21.5% of the total count, respectively. No zooplanktons were recorded in the samples.

2.3 Air Quality

2.3.1 Meteorology/Climatology

Tupi experiences climate categorized under the third category which is distinctly denoted by short dry seasons experienced annually. Temperature can reach 27.4°C in June, July, and August during the rainy season while temperatures can increase up to 28.5°C in summer (March-May).

FIGURE 2-45. CLIMATOLOGICAL MAP OF THE PHILIPPINES



Source: PAGASA

2.3.1.2 Seasonal Temperature and Rainfall Change

TABLE 2-15. OBSERVED SEASONAL BASELINE IN TEMPERATURE (1971-2000)

Period	Observed Baseline in Centigrade (1971 – 2000)
December-January-February	27.7°C
March-April-May	28.5°C
June-July-August	27.4°C
September-October-November	27.7°C

Source: PAGASA

TABLE 2-16. HISTORY OF RAINFALL RATE BY MONTHS (2013-2015)

Month	Years			Average Rainfall in 3years
	2013	2014	2015	
	Rainfall (in mm.)	Rainfall (in mm.)	Rainfall (in mm.)	
January	7.91	8.46	11.83	9.4
February	14.2	10.34	15.92	13.47
March	9.88	7.12	12.45	9.82
April	11.12	14.2	13.7	13.01
May	12.68	20.29	19.35	17.44
June	12.71	16.96	18.91	16.19
July	11.43	13.9	14.98	13.44
August	8.33	10.62	13.55	10.83
Month	**Years**			**Average Rainfall in 3years**
	2013	**2014**	**2015**	
	Rainfall (in mm.)	**Rainfall (in mm.)**	**Rainfall (in mm.)**	
September	9.36	14.43	12.03	11.94
October	8.32	15.09	12.28	11.89
November	-	-	13.51	-
December	-	-	11.36	-

Source: OMAg

TABLE 2-17: OBSERVED BASELINE RAINFALL RATE (1971-2000)

Period	Observed Baseline in mm (1972-2000)
December-January-February	183.3
March-April-May	234.1
June-July-August	402.0
September-October-November	351.7

Source: MGB Region 12

TABLE 2-18: PROJECTED CHANGES IN CLIMATE VARIABLES, MUNICIPALITY OF TUPI AND PROVINCE OF SOUTH COTABATO.

Climate Variable	Observed Baseline (1971-2000)	Specific Change Expected and Reference Period	General Changes in Climate Variable	Informa-tion About Pattern of Change	Popu-lation	Natural Resour-ces	Criti-cal Facilit ies	Urban Use Areas	Infrastruc -ture Utilities
A	B	C	D	E	F	G	H	I	J
Temperature	27.7 °C during the DJF 28.5°C during the MAM 27.4 °C during the JJA 27.7 °C during the SON	28.7°C by 2020 and 29.7°C by 2050 during the DJF 29.7°C by 2020 and 30.8°C by 2050 during the MAM 28.5 °C by 2020 and 29.2°C by 2050 during the JJA 28.8 °C by 2020 and 29.8 °C by 2050 during the SON	.+1.0 to 1.2 °C (2020) and + 2.0 to 2.3°C (2050)	Slightly more warming in summer (MAM)	Yes	Yes	Yes	Yes	Yes

Continued…

Rainfall	183.3 during the DJF 234.1 during the MAM 402.8during the JJA 351.7 during the SON	201.63 by 2020 and 199.06 by 2050 during the DJF 213.73 by 2020 and 208.82 by 2050 during the MAM 354.06 by 2020 and 330.30 by 2050 during the JJA 327.78 by 2020 and 301.06by 2050 during the SON	Seasonal Increase /Decrease	Increasing in DJF in 2020 to 2050 compared to (1971-2000)	Yes	Yes	Yes	Yes	Yes
Climate Variable	**Observed Baseline (1971-2000)**	**Specific Change Expected and Reference Period**	**General Changes in Climate Variable**	**Information About Pattern of Change**	**Population**	**Natural Resources**	**Critical Facilities**	**Urban Use Areas**	**Infrastructure Utilities**
A	B		D	E	F	G	H	I	J

Continued…

Number of Hot days	1397 days	3784 days exceeding 35°C in 2020 6430 days exceeding 35°C in 2050	Increasing the number of hot days (exceeding 35°C)	Significant increase in the number of hot days expected in 2020 to 2050	Yes	Yes	Yes	Yes	
Number of Dry days	8704 days	7526 days with <2.5 mm of rain in 2020 8026 days with <2.5 mm of rain in 2050 From observed baseline of 8704 days	Decreasing the Number of dry days (<2.5mm of rain)	There will be more days with rain fall		Yes		Yes	
Extreme daily Rainfall Events	1 extreme rainfall events exceeding 150mm	1 days with >150 mm of rain in 2020 1 days with >150 mm of rain in 2050	1 extreme rainfall events exceeding 150mm in 2020	There will be 1 extreme Rain fall events exceeding	Yes	Yes	Yes	Yes	Yes

Continued…

			and 20 50	150mm every period (2020, 2 050)					
Typhoon/ Super typhoon	Strong wind / heavy rain events	*See PAGASA projections*			Yes	Yes	Yes	Yes	

Climate Variable	Observed Baseline (1971-2000)	Specific Change Expected and Reference Period	General Changes in Climate Variable	Informa-tion About Pattern of Change	Popula-tion	Natural Resour-ces	Critical Facilities	Urban Use Areas	Infra-structure Utilities
A	B	C	D	E	F	G	H	I	J
	Tornado								
Geophysical hazard	Volcanic Eruption (Mt. Matutum last eruption 1911)								
	Liquefaction/ Sinkholes								

	Landslides								
	Tectonic movements/ earthquake								

Source: Tupi Comprehensive Development Plan, 2017

TABLE 2-19: CLIMATE CHANGE IMPACTS, MUNICIPALITY OF TUPI, PROVINCE OF SOUTH COTABATO

Climate Variable	General Changes Expected in Climate Variables	Information about Patterns of Change	Population	Natural Resource Based Production Areas	Critical Point Facilities	Urban Use Areas	Infrastructure and Utilities	Potential Impact Area/s
A	B	C	D	E	F	G	H	I
Temperature	.+1.0 to 1.2 °C (2020) and + 2.0 to 2.3°C (2050)	Slightly more warming in summer (MAM)	More heat-related illnesses and other summer-related diseases affecting the health of the vulnerable population (senior citizen, women, children). Increase consumption of potable	Increase incidence of pest Infestation to flora and fauna. Prone to forest fire occurrences. Drop in crop yields; reduction of farmer's income and inability to plant due to poor precipitations.	Increase of admission to hospital. Increase in electrical consumption to ventilate public/private hospitals, health centers and other basic social facilities.	Increase in water consumption and domestic uses, competition on limited water supply and limited power supply. Affect the supply of potable water supply to Level 3	Reduced source of water in water systems and watershed. Increased generation of power to accommodate needs of public and private facilities which needs	All Barangays

			water sources and affect water supply to areas supplied by Level 3 PWS	Decrease in irrigation.		consumers of populated areas (Barangay Poblacion, Crossing Rubber and Palian)	ventilation. Reduction of supply of potable water supply to Level 3 consumers.	
Climate Variable	**General Changes Expected in Climate Variables**	**Information about Patterns of Change**	**Population**	**Natural Resource Based Production Areas**	**Critical Point Facilities**	**Urban Use Areas**	**Infrastructure and Utilities**	**Potential Impact Area/s**
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
Rainfall	Seasonal Increase/Decrease	Increasing in DJF in 2020 to 2050 compared to (1971-2000)	Increase on morbidity especially to children and senior citizen.	Increase in pest infestations to flora and fauna. Lesser crop-yields	Two hospitals, health centers and schools will be unable	Increase of water-borne diseases and health illnesses (cough	Damages farm to market roads (Acmonan, Bololmala, Bunao,	Low-lying areas prone to river flooding/flashfloods. Low floods

			Increase in illnesses and outbreak of dengue or other vector borne and water related diseases. Greater demand to basic social and health services/provisions.	due to wilting. Reduction on farmer's income. Livestock and poultry prone to diseases. Farmers and agriculture-based industries affected severe rainfall. Destruction of inland fishery. Damage to crops.	to accommodate the influx of evacuees and patients (in case of outbreak like dengue). Increase demand of potable water sources and poor sanitation. Decline in the quality of water sources of barangays and various public health facilities	and colds) affecting children, elderly and other vulnerable population. Interruption or decreased economic activities. Increase demand for social services affected by floods and other hazards.	Crossing Rubber, Kalkam,) Lunen, Palian, Poblacion, Polonuling and Simbo. Damage to line canals and bridges caused by flood debris. Disruption of transportation facilities (i.e. roads and bridges) affecting area access and	could affect 95.6% (66,895) of the total population of the15 barangays. 2,355 of the population will be affected by moderate flood; and 1.04% or 726 persons are vulnerable to high flood classification (Bololmala, Bunao, Kalkam, Palian,

							linkages. Economic disruption to affected areas caused by floods and hazards	Poblacion, Polonuling and Simbo).
Climate Variable	**General Changes Expected in Climate Variables**	**Information about Patterns of Change**	**Population**	**Natural Resource Based Production Areas**	**Critical Point Facilities**	**Urban Use Areas**	**Infrastructure and Utilities**	**Potential Impact Area/s**
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
			Increase in problem in health and sanitation.	Flooding and waterlogging of production areas resulting to lesser or loss of production.	Insufficiency of medicines and swelling of patients converging to two hospital facility (e.g. beds).	Low-lying urban barangays prone to river flooding. Failure of drainage facilities due to clogging by debris.	Damages to bridges, canals and other lifeline utilities (power lines)	Settlements located on low-lying areas near Palian River (e.g. Simbo, Linan and Bunao)

						Disruption of water services due to damages to water pipelines. Contamination of water sources like open-wells		
Climate Variable	**General Changes Expected in Climate Variables**	**Information about Patterns of Change**	**Population**	**Natural Resource Based Production Areas**	**Critical Point Facilities**	**Urban Use Areas**	**Infrastructure and Utilities**	**Potential Impact Area/s**
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
Number of Hot days	Increasing the number of hot days (exceeding 35°C)	Significant increase in the number of hot days expected in 2020 to 2050	Increase morbidity to young and old dependents Increase on heat-related	Increase incidence of pest Infestation to crops, livestock and poultry	Increased hospital admissions and Affect supply of medicine. Occupatio	Competing uses on water and power supply. Increase in food and basic	Possible rationing or reduction of supply of water and decreased water	All Barangays

			illnesses or other diseases (measles, mumps, etc). Increase in water consumption and shortage of water supply to areas affected by dry spells.	products. Low agricultural output/less production. Possible increases of prices of agricultural and non-agricultural commodities. Increase use of water to agriculture and productive areas of the municipality.	nal hazards, discomfort and heat-related stress are likely to occur to public health facilities (hospitals and health centers).	commodities	volume of dams. Increased in water extraction to aquifers and residents with Level 3 PWS	
Climate Variable	**General Changes**	**Information about**	**Population**	**Natural Resource**	**Critical Point**	**Urban Use Areas**	**Infrastructure**	**Potential Impact**

	Expected in Climate Variables	Patterns of Change		Based Production Areas	Facilities		and Utilities	Area/s
A	B	C	D	E	F	G	H	I
		Significant decrease in the number of hot days expected in 2020 to 2050	Increase in the provision of health care and services/provisions. Poor sanitation due to the decline of quality and quantity of water resources.	Drop in agricultural production. Increase in the prices of agricultural and non agricultural products. Affect the planting calendar of farmers	Discomfort to schools and children. Barangay Health Stations are unable to cope with the provision of health care and services. Increase demand to water supply.	Migration of informal settlers and population to urban areas. Intrusion to public and private lands	Unable to provide housing facilities to relocatees. Limited number of housing facilities of relocation sites.	All Barangays

Climate Variable	General Changes Expected in Climate Variables	Information about Patterns of Change	Population	Natural Resource Based Production Areas	Critical Point Facilities	Urban Use Areas	Infrastructure and Utilities	Potential Impact Area/s
A	B	C	D	E	F	G	H	I
Number of Dry days	Decreasing the Number of dry days (<2.5mm of rain)	There will be more days with rainfall	Increase in heat related sickness and health diseases (eg. cough and colds, diarrhea) especially to young and old dependents	Increase incidence of pest Infestation to crops, livestock and poultry products. Lower crop yields reducing farmer's income and affecting the agricultural activities.Slow down of economic	Two hospitals, health centers and schools will be unable to accommodate the influx of evacuees and patients (in case of outbreak like dengue). Increase demand of potable water	Discomfort to commuting public due to floods. Lack of transportation and other public conveyance. Disruption of traffic. Slowdown of economic activities	Roads	All Barangays

				ventures.	sources and poor sanitation. Decline in the quality of water sources of barangays and various public health facilities			

Climate Variable	General Changes Expected in Climate Variables	Information about Patterns of Change	Population	Natural Resource Based Production Areas	Critical Point Facilities	Urban Use Areas	Infrastructure and Utilities	Potential Impact Area/s
A	B	C	D	E	F	G	H	I
Extreme daily Rainfall Events	1 extreme rainfall events exceeding 150mm in 2020 and 2050	There will be 1 extreme rainfall events exceeding 150mm every period (2020, 2050)	Possible destruction of life and property triggered by extreme rainfall events. Vulnerable are the young and old population.	Damages to crops, livestock and fisheries. Disruption of agricultural activities. Reduce food supply and disruption of delivery of essential commodities	Disruption of delivery of basic services. Schools likely unable to accommodate evacuees. Damages to social services facilities	Disruption of economic activities. Increase in market prices of basic commodities. Damages to public and private properties	Damages to roads, bridges, line canal, and other lifeline utilities. Earth type roads without line canals could be severely damaged. Over-populated evacuation sites (schools, health	Flood and landslide areas

Continued…

							centers, barangay structures)	
Climate Variable	**General Changes Expected in Climate Variables**	**Information about Patterns of Change**	**Population**	**Natural Resource Based Production Areas**	**Critical Point Facilities**	**Urban Use Areas**	**Infrastructure and Uitilities**	**Potential Impact Area/s**
A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
			Destruction to life and property especially to residences located to upland areas and	Damages to agricultural lands. Loss of income. Disruption on the delivery of	Disruption of delivery of basic services due to damaged roads. Limited	Disruption of economic activities. Increase in market prices of basic commoditi	Damages to roads, bridges, line canal, and other lifeline utilties	Roads exposed to landslide(Miasong, Linan, Linan, Cebauano , Acmonan,

			low lying areas	agricultural and non agricultural commoditi es.	area of critical facilities.	es.		Polonuling, Simbo, Kalkam, Lunen and Tubeng)
			Highly-populated urban areas (Poblacion and Polonuing) are susceptible to in migration.	Reduce food supply, increase in prices of commoditi es (agricultur al and non agricultural) and limited delivery of esential and non essential products/s ervices	Damages to social services facilities and overwhelm ed staff (Barangay)	Possible intrusion of migrants or informal settlers occupying private and danger zones (rivers)	Damage to roads, line canals, bridges and lifeline utilities	Upland area from Miasong, Acmonan, Linan, and Kalkam

Climate Variable	General Changes Expected in Climate Variables	Information about Patterns of Change	Population	Natural Resource Based Production Areas	Critical Point Facilities	Urban Use Areas	Infrastructure and Utilities	Potential Impact Area/s
A	B	C	D	E	F	G	H	I
			Possible injuries and death triggered by extreme rainfall events	Damages to crops, livestock and fisheries livelihood	Destruction of homes, property and infrastructures. Evacuation sites will be over crowded.	Disruption of the delivery of public services. Displacement of affected families	Damages to water and powerlines.	Flood-prone Barangays

Source: Tupi Comprehensive Development Plan, 2017 – 2022

2.3.2 GREENHOUSE GAS EMISSIONS

Greenhouse gases (GHGs) are gaseous constituents of the atmosphere, either natural or anthropogenic (as a result of human activity), that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by the Earth's surface, the atmosphere itself, and by clouds. These gases surround the planet preventing the loss of heat into outer space. By trapping the heat, they contribute to the warming of the earth's surface causing changes in weather condition, sea levels, and land use patterns, commonly referred to as "climate change" (IPCC, 2007).

As early as 1991, the Philippines have been proactive in responding to the impact of climate change, which include the reduction of GHG emissions in the atmosphere. As of 2000, the Philippine GHG emission is approximately 32,936.45 Gg of CO_2, 1,968.56 Gg of CH_4 and 43.11 Gg of N_2O as shown in the table below:

TABLE 2-20. PHILIPPINE GREENHOUSE GAS EMISSION

SECTOR	CO_2, Gg	CH_4, Gg	N_2O, Gg	CO_2 Emission, Gg
Energy	62, 499.10	304.14	2.52	69,667.24
Industrial	8, 604. 74	0.24	-	8,609.78
Processes				
Agriculture	-	1,209.79	37.41	37.002.69
LUFC	(104,040.29)	(46.28)	(0.32)	(105,111.37)
Waste	-	500.67	3.50	11,599.07
Total	(32,936.45)	1,968.56	43.11	21,767.41

Note: CH_4 GW Potential – 21; N_2O GW Potential-310; * - CO_2 + (CH_4*21) + (N_2O*310)

Majority of Greenhouse Gas (GHG) emissions from the golf course project are expected to be generated from its construction activities (fuel/electricity use for the operation of construction vehicles and equipment). The GHGs that are typically generated from fuel/electricity use for the operation of construction vehicles and equipment are carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). Out of these gases, the major gas emitted is CO2. Methane and nitrous oxide emissions have a very low share in terms of emissions. Hence, this report only focused on CO2 emissions.

2.3.2.1 Methodology

The CO2 were calculated using emission factor-based estimation method. The methodology estimates the CO2 emissions by multiplying a level of activity data (AD) by an emission factor (EF). Activity data is a quantified measure of activity resulting in emissions during a given period of time (e.g. data on fuel consumption (liters/km) and purchased electricity (kWh) while the emission factor is the average emission rate of a given GHG for a given source, relative to units of activity. The general equation is shown below. This is based on The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard, Revised Edition, World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI), 2006

Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories and 2014 IPCC Assessment Report.

Equation: GHG Emissions = AD x EF

2.3.2.2 Results

The sources of carbon dioxide emission in the project are the fuels used in the operation of heavy machinery and equipment such as trucks and backhoes during its construction.

The construction of the Project is expected to contribute an approximately 0.000185% of the total CO2 emission based on the 2000 GHG emission data of the Philippines, which is a small contribution to the total anthropogenic CO2 load. Moreover, this will only be temporary since the construction project will only be in four (4) years. In order to minimize unnecessary CO2 generation from construction activities, the following measures will be implemented:

- Implement regular inspection and preventive maintenance of heavy equipment, machineries and service vehicles to meet the DENR standards on vehicular emissions; and
- Use electric or fuel-efficient equipment, machineries and vehicles and maximize its operation, if possible.

The following table presents the CO_2 emission by source:

Table 2-21. ESTIMATED CO_2 EMISSIONS BY SOURCES DURING CONSTRUCTION

Equipment	No. of Units	Fuel Type	Fuel Consumption (L/100 km) per Unit[A]	Assumed Distance Travelled (km/yr) per Unit	Fuel Consumption (L/yr) per Unit	Emission Factor (kg CO_2/L) per Unit[B]	Total Calculated CO2 Emission (MT CO2/Yr)
Dump truck	9	Diesel	31.6	3000	948	2.68	23
Backhoe	3	Diesel	31.6	3000	948	2.68	8
Pay Loader	2	Diesel	31.6	3000	948	2.68	5
Compactor	2	Diesel	31.6	3000	948	2.68	5
Water Tanker	1	Diesel	31.6	3000	948	2.68	3
Bulldozer	1	Diesel	31.6	3000	948	2.68	3
Concrete Mixer	2	Diesel	31.6	3000	948	2.68	5
Service Vehicle	4	Diesel	31.6	3000	948	2.68	10
Total Calculated CO2 Emission (MT CO2/yr)							**62**

Notes: [A] Source: Reduction and Testing of Greenhouse Gas (GHG) Emissions from Heavy Duty Vehicles. AEA, Ricardo: s.n., 2010

[B] Source: Emission Factors for Greenhouse Gas Inventories (last modified: 9 March 2018), US EPA

2.3.3 AMBIENT AIR AND NOISE QUALITY

2.3.3.1 METHODS OF SAMPLING AND ANALYSIS

2.3.3.1.1 Ambient Air Quality Monitoring

The methods of sampling and analysis of TSP, PM10, SO2, NO2, and CO for the ambient air quality monitoring were based on the DENR standards. The methodologies are discussed in this section and presented in Table 2-22.

TABLE 2-22. METHODS OF AMBIENT AIR SAMPLING AND ANALYSIS

Parameter	***Sampling Methodology / Analysis***
Total Suspended Particulates (TSP)	*High Volume – Gravimetric Method*
Particulate Matter less than 10 microns (PM10)	*High Volume – Gravimetric Method*
Sulfur Dioxide (SO_2)	*Bubbler – Pararosaniline Method*
Nitrogen Dioxide (NO_2)	*Bubbler – Griess-Saltzman Reaction Method*
Carbon Monoxide (CO)	*Direct Reading – Instrumental Method*

Reference: USEPA 40 CFR, Part 50

2.3.3.1.2 Total Suspended Particulates

Sampling of TSP was carried out by using a high-volume sampler. Ambient air was drawn into a covered housing and through a collecting medium of a pre-weighed glass microfiber filter paper at a controlled flow rate over the specified sampling period. The filter paper with retained particles was recovered after sampling and desiccated for 24 hours in the laboratory followed by accurate weighing (gravimetric method) using a calibrated mass balance. The net weight (mass gain) from the tare and final masses of the filter paper corresponds to the total amount of particulates collected. The concentration of TSP in ambient air was determined from the ratio of total mass of particulates collected and the total normal volume of air sampled (total volume of air sampled corrected to normal conditions of 25 °C and 760 mm Hg).

2.3.3.1.3 Particulate Matter less than 10 microns

Sampling of PM10 was carried out by using a high-volume sampler. Ambient air was drawn into a covered housing and through a collecting medium of a pre-weighed glass microfiber filter paper at a controlled flow rate over the specified sampling period. The filter paper with retained particles was recovered after sampling and desiccated for 24 hours in the laboratory followed by accurate weighing (gravimetric method) using a calibrated mass balance. The net weight (mass gain) from the tare and final masses of the filter paper corresponds to the total amount of particulates collected. The concentration of PM10 in ambient air was determined from the ratio of total mass of particulates collected and the total normal volume of air sampled (total volume of air sampled corrected to normal conditions of 25 °C and 760 mm Hg).

2.3.3.1.4 Sulfur Dioxide

Sulfur dioxide in the ambient air was sampled using a handy gas sampler by aspirating air at a controlled flowrate into a solution of 0.04 M sodium tetrachloromercurate (TCM) through a glass midget impinger over the specified sampling period. The solution was then treated in the laboratory with formaldehyde and with a specially purified acid-bleached pararosaniline to form an intensely colored pararosaniline methyl sulfonic acid. The color intensity was measured spectrophotometrically at 548 nm and is directly related to the amount of SO2 collected. SO2 concentration was determined from the difference between the absorbance of the sample and blank, multiplied by the calibration factor, and divided by the total normal volume of air sampled.

2.3.3.1.5 Nitrogen Dioxide

Nitrogen dioxide in the ambient air was determined using Griess-Saltzman Reaction Method. Air was drawn using a handy gas sampler at a controlled flowrate into an azo dye forming reagent through a glass midget impinger over a specified sampling period. The absorption reaction produces a stable red-violet color. The color intensity was read by a spectrophotometer in a laboratory at 550 nm and is directly related to the amount of NO2 collected. NO2 concentration was determined from the difference between the absorbance of the sample and blank, multiplied by the calibration factor, and divided by the total normal volume of air sampled.

2.3.3.1.6 Carbon Monoxide

Carbon Monoxide in air was measured by a direct-reading gas analyzer equipped with a special sensor for the gases. The minimum detection limit for CO is 1 ppm. The average value obtained during monitoring was recorded.

2.3.3.2 SAMPLING OBSERVATIONS

Meteorological observations such as wind direction and speed were recorded during the duration of the activity in order to correlate the interpretation of the gathered concentrations.

2.3.3.2.1 Wind Direction

Wind direction is the direction from which the wind originates. It is reported in the cardinal directions. The wind direction in a certain station is determined by observing the motion of the wind from field observation of objects such as trees, grasses, smoke, etc. using a compass as a reference.

2.3.3.2.2 Wind Speed

Wind speeds were recorded during the sampling activity using the Beaufort Wind Scale as a guide. Devised by Britain's Admiral Sir Francis Beaufort, this was one of the first scales used to estimate and report wind speeds via visual observations. *Table 2-23* details a brief categorization of the Beaufort wind forces along with the corresponding equivalent speeds, wind descriptions, and land observations.

TABLE 2-23. BEAUFORT WIND SCALE

Force	*Equivalent Speed*	*Description*	*Land Observation*

	(m/s)		
BF0	0	Calm	● Calm ● Smoke rises vertically
BF1	1	Light Air	● Direction of wind shown by smoke drift, but not by wind vanes.
BF2	3	Light Breeze	● Wind felt on exposed skin ● Leaves rustle ● Wind vanes begin to move
BF3	4.5	Gentle Breeze	● Leaves and small twigs constantly moving ● Light flags extended
BF4	7	Moderate Breeze	● Dust and loose paper raised ● Small branches begin to move

2.3.3.2.3 Cloud and Rain Description

The systems used to describe sky condition and rain description during the sampling period are outlined in Tables 2-24 and 2-25, respectively. These terminologies were adopted and used by the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA).

TABLE 2-24. CLOUD DESCRIPTION

Sky Condition	*Definition / Description*
Clear or Sunny Skies	• State of the sky when it is cloudless, totally clear or with a few small light clouds visible. • Has a total cloud cover of less than one okta.
Partly Cloudy	• State of the sky is within 2-5 oktas total cloud cover or has between 30% to 70% cover of the celestial dome.
Partly Cloudy to at Times Cloudy	• Mostly partly cloudy but there are times when more than 70% of the celestial dome is covered with clouds.
Mostly or Mainly Cloudy	• The sky is mostly covered with clouds but with possible brief periods of sunshine. • The total cloud cover is between 6 to 8 oktas.

Sky Condition	*Definition / Description*
Cloudy	• *The sky is covered with clouds between 6 to 8 oktas or has more than 70% cloud cover.* • *Predominantly more clouds than clear sky.* • *For a longer period during the day, the sun is obscured by clouds.*
Overcast	• *The sky is totally or completely covered with thick and opaque clouds, 8 oktas or around 100% cloud cover.*

Source: PAGASA

Table 2-25. RAIN DESCRIPTION

Rain Description	*Definition / Description*
Very Light Rains	• *Scattered drops that do not completely wet an exposed surface regardless of duration.*
Light Rains	• *The rate of fall is from trace to 2.5 mm per hour.* • *Individual drops easily identified and puddles (small muddy pools) form slowly.* • *Small streams may flow in gutters.*
Moderate Rains	• *The rate of fall is between 2.5 mm to 7.5 mm per hour.* • *Puddles rapidly forming and down pipes flowing freely.*
Heavy Rains	• *The rate of fall is greater than 7.5 mm per hour.* • *The sky is overcast, there is a continuous precipitation.* • *Falls in sheets, misty spray over hard surfaces.* • *May cause roaring noise on roofs.*
Monsoon Rains	• *Heavy and continuous precipitation attributed to either the Southwest* *rtheast Monsoon.*
Occasional Rains	• *Not frequent but is recurrent precipitation.*
Widespread Rains	• *Precipitation occurring extensively throughout an area.*
Frequent rains	• *Precipitation occurring regularly and often throughout the time duration.*
Intermittent Rains	• *Precipitation which ceases at times and re-occur again.*

Source: PAGASA

2.3.3.2.4 Daytime Ambient Noise Level Monitoring

A direct-reading sound level meter (in A-weighting mode) was used to measure noise level data at each sampling station. A-weighted (dBA) scale was selected as required by the 1978 NPCC and the 1980 NPCC standards were also based on the same weighting network. A-weighting network most closely approximates the response of human ear to various sound frequencies.

The procedure used followed that of Wilson (1989), in which at least a total of fifty (50) readings were recorded in order to increase the confidence limits of the data. Procedures outlined by Wilson (1989) were adopted in the monitoring as the time interval, duration of sampling, size of data needed, and methods of noise level analysis were not specified in the 1978 NPCC.

For daytime ambient noise level monitoring, measurements were taken between 0900H to 1800H. According to the provision provided in the NPCC Memorandum Circular 002 (1980), the arithmetic median of seven (7) maximum-recorded noise levels is regarded as the noise level comparable to the standard. Field observations during the monitoring were also noted so as to identify the primary sources of noise in each area.

2.3.3.3 RESULTS AND DISCUSSION

2.3.3.3.1 Ambient Air Quality Monitoring

Two (2) designated sampling stations were assessed with TSP, PM10, SO2, NO2 and CO and the summary of results is presented in Table 2-26. All the pollutant concentrations have complied with the DENR National Ambient Air Quality Standards (NAAQS) for Source Specific Air Pollutants of 300 µg/Ncm for TSP, 200 µg/Ncm for PM10, 340 µg/Ncm for SO_2, 260 µg/Ncm for NO_2, and 30 ppm for CO – all were based on 60 minutes averaging time.

TABLE 2-26. AMBIENT AIR QUALITY MONITORING RESULTS OF TSP, PM10, SO_2, NO_2, AND CO

Station	***Location***	***Time of Sampling (22-May-2021)***	***TSP*** *(µg/Ncm)*	***PM10*** *(µg/Ncm)*	***SO_2*** *(µg/Ncm)*	***NO_2*** *(µg/Ncm)*	*(ppm)*
A1	*Purok Pag-asa (Community Area)*	*0900H-1000H*	*< 1.6*	*< 1.6*	*6.4*	*4.6*	*9*
A2	*Near Guard House and Admin Office*	*1027H-1127H*	*< 1.6*	*< 1.6*	*5.2*	*3.7*	*6*
DENR National Ambient Air Quality Standards for Source Specific Air Pollutants based on 60 minutes averaging time			***300***	***200***	***340***	***260***	***30***

Note: For the non-detect values, the detection limit in µg was divided by the total normal volume of air sampled.

From the table above, all stations complied with concentrations for TSP, PM10, SO2, NO2 and CO were below the NAAQS, and have remarkably low to non-detectable values, except for CO. Station *A1* is situated near a community area, while station A2 is near guard house and admin office.

Other sampling observations and photo documentations are summarized in *Table 2-27*. Also, location map of the sampling stations is shown in *Figure 2-43*.

Moreover, the summary of results including the gathered meteorological data, laboratory certificate of analyses, and calibration records of the equipment used were attached in *Annexes A, B,* and *C*, respectively.

FIGURE 2- 46. AMBIENT AIR QUALITY AND NOISE LEVEL MONITORING STATIONS

TABLE 2-27. FIELD OBSERVATIONS AND PHOTO DOCUMENTATIONS DURING

Station	*Sampling Observations*	*Photo Documentation*
A1	*ation was situated in an uneven grassy*	
Purok Pag- Asa (Commun ity Area)	*d, near community area, surrounded by grass and plants.* *her was sunny with mostly cloudy skies and*	
ay 22, 2021	*ir blowing from southwest during sampling.*	
	ge ambient air temperature was 31.6°C.	
00H-1000H		
A2		
	ation was situated on flat cemented ground,	

ear guard	*nded by grass and plants.*	
ouse and		
dmin office	*ner was sunny with partly cloudy skies and*	
ay 22, 2021	*ir blowing from southwest during sampling. Average ambient air temperature was 32.7°C.*	
27H-1127H		

2.3.3.3.2 Daytime Ambient Noise Level Monitoring

Two (2) designated stations around the plant's periphery were monitored for ambient noise level The results are presented in Table 2-28 while the primary sources of noise are summarized in Table 2-29.

As per NPCC Memorandum Circular 002 Series of 1980, the applicable standard for daytime measurement is 50 dBA for Class AA Areas and 55 dBA for Class A Areas.

TABLE 2-28. DAYTIME AMBIENT NOISE LEVEL MONITORING RESULTS

Station	*Location*	*Time of Sampling (22-May-2021)*	*Noise Level* (dBA)*	*NPCC Standard*
N1	*Purok Pag-asa (Community Area)*	*1010H-1019H*	*54*	***50AA***
N2	*Inside Admin Office Compound*	*1116H-1125H*	*59*	***55A***

** Median of seven highest recorded noise levels (NPCC, 1978).*

AA – A section or contiguous area which requires quietness such as an area within 100 meters from school sites, nursery schools, hospitals and special homes for the aged.

A – A section or contiguous area which is primarily used for residential purposes.

As shown above, all stations were below the applicable standard for Class C Areas The equipment calibration certificate of the noise meter used during the measurement is attached in *Annex C*.

TABLE 2-29. OBSERVED PRIMARY SOURCES OF NOISE

Station	*Location*	*Sources of Noise*
N1	*Purok Pag-asa (Community Area)*	*Near Community Area. People talking, barking dogs, sound systems, and vehicles passing by.*
N2	*Inside Admin Office Compound*	*People talking, and vehicles passing by.*

2.3.3.4 IMPACT ASSESSMENT – AIR AND NOISE QUALITY

Earth movement and cut and fill activities during the construction phase will generate dust. Re-suspension of dust and particulate matter from the area even during weak to moderate wind events will definitely occur. This will cause some increase in the Total Suspended Particulate (TSP) within the immediate vicinity. This impact is temporary however, and can be mitigated by frequent watering of the soil surface.
It is also expected that gaseous emissions during construction will increase. This is due to vehicle exhaust since transport of materials needed during the construction phase

requires trucks and loaders. It is projected however, that the insignificant emission levels from limited number of vehicles will not exceed existing ambient air quality standards. The negative impact on air quality can be easily minimized by intermittent operation of the vehicles and transport facilities.

During operation phase, the use of generator set, diesel operated equipment and ingress/egress of guests' vehicles would most likely contribute to the emission of SOx, NOx and generation of dusts.

To minimize emissions from generator and vehicles, the following shall be undertaken:

- "Turn off Engine while Parked" sign shall be posted at the parking area.
- Regular maintenance of generator set and diesel operated equipment.
- Ensure that appropriate control facilities are installed and being used to reduce emission and help deaden the noise.
- Permit to Operate shall be secured for all Air Pollution Source Equipment.

2.4. PEOPLE

2.4.1 Methodology

This section of EIS report elaborates the current socio-economic conditions of project-affected people (PAPs) and its perceptions towards the project. It also presents the impact management plan, and the social development and EIC frameworks for the proposed Brittannika Golf Course project.

In the conduct of this study, the team employed the following methodologies:

- **Desk review** - collection and analysis of secondary data, reports, relevant studies, and other pertinent data from reliable sources;
- **Information, Education, and Communication Campaign –** an IEC campaign was conducted last January 9, 2021 in the affected barangays of Tupi, South Cotabato. The EIC campaign was done through field visit, community consultations, and distribution of IEC materials;
- **Reconnaissance Survey -** preliminary perception survey was also implemented to have an initial information about views and opinions of project-affected people (PAPs); and
- **Socio-economic and Perception Survey.** A scientific investigation was conducted to characterize the socio-economic conditions of the affected households using computer-assisted personal interview (CAPI) technique. A total of 100 respondents were interviewed using *Kobocollect* and *Kobotoolbox* applications. A right-coverage rule was adopted in the selection of respondents to ensure proper distribution and well-representation of affected households. Figure 2-44 below depicts the spatial distribution of respondents.

2.4.2 Profile of Tupi, South Cotabato

Tupi is a first-class municipality in the province of South Cotabato created under EO 612 of President Elpidio Quirino on September 11, 1953. It has a total land area of

31,150 hectares which are politically subdivided into 15 barangays. It is considered as the fruit, vegetable and flower basket of the province because of flourishing area of agriculture.

Population Size and Growth. The total number of individuals currently residing in Tupi was considered in assessing the area's demographic condition. Based on the secondary data from PSA and the local government, the municipality is a home of 59,264 individuals or 15,771 households with an average of 4 household-members (2018 PSA Census). From 31,591 residents in 1980, the population increases by almost 70 percent or 53,440 in year 2000. Population growth was still increasing but at decreasing rate (10.86%) between 2000 to 2018. The influx of population is attributed to the expansion of pineapple plantations and other investments in Tupi and its neighboring municipalities. However, the downing growth rate was attributed to the intensified family planning program of the national and local government units.

TABLE 2-30. POPULATION OF TUPI, SOUTH COTABATO

Year	Total Population	Growth Rate (%)	Average Household Size
2018	59,246	10.86	4
2000	53,440	69.16	-
1980	31,591	-	-

Population Density. The average number of persons per square kilometer of land area or the population density in Tupi was also considered in the study. The purpose is to determine the magnitude of congestion based on the given land area and total population per barangay.

As revealed, the municipality has a total land area of 31,150 hectares with a population density of 193 persons per square kilometer. Barangay Poblacion is the most populated barangay with a population density of 1,232 per square kilometer. Meanwhile, barangay Miasong is less congested with population density of only 68 persons per square kilometer. As to barangay Linan, the directly affected area, it has a population density of 103 persons per square kilometer.

As reflected in the Provincial Physical Framework Plan for 2014 to 2019, the locality is considered as minor urban center based on the proposed hierarchy of settlements. Tupi is also categorized as rural municipality based on the number of rural barangays.

TABLE 2-31. POPULATION DENSITY BY BARANGAY IN THE MUNICIPALITY OF TUPI.

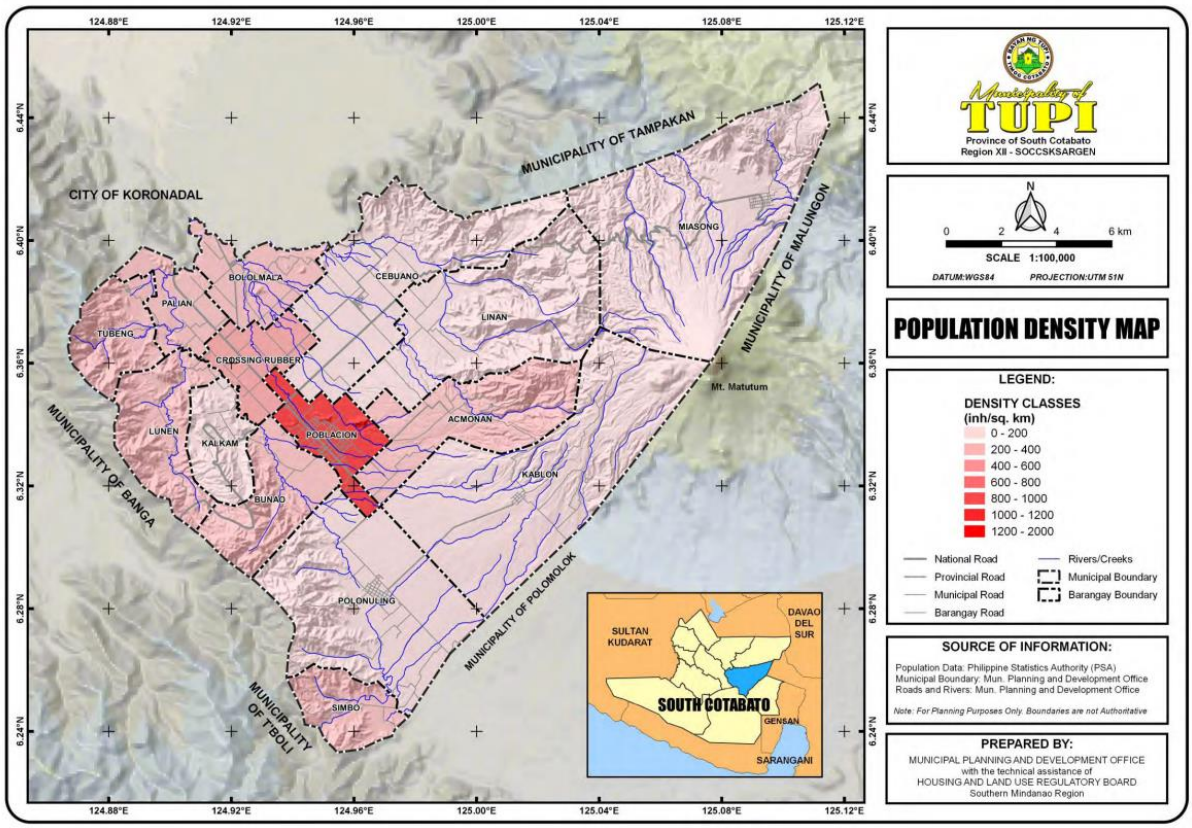
Barangay	Population	Land Area (Sq. Km)	Population Density (Person/sq. Km)
Urban			
Cebuano	4817	33.16	145
Kablon	4278	47	91
Poblacion	10966	8.9	1,232
Polonuling	6828	34.23	199
Sub-Total	26889	123.29	218
Rural			

Barangay	Population	Land Area (Sq. Km)	Population Density (Person/sq. Km)
Acmonan	4261	21.16	201
Bololmala	3424	10	342
Bunao	4626	14	330
Cr. Rubber	3379	8	422
Kalkam	1478	10.86	136
Linan	2978	28.98	103
Lunen	2637	15.46	171
Miasong	3507	51.65	68
Palian	3027	10.29	294
Simbo	1664	8.4	198
Tubeng	2287	9.41	243
Sub-Total	33268	188.21	177
Total	60157	311.5	193

Source: CBMS Census 2017-2018

Figure 1 illustrates the population density map of the municipality. This map was taken from the report of the Municipal Planning and Development Office (MPDO) of Tupi. As reflected, Poblacion area is quite congested compared to other barangays. This is expected since the barangay is the center of commerce and trade or business activities of the municipality.

FIGURE 2-47. POPULATION DENSITY MAP OF TUPI, 2015.



Population Composition by School-Age, Working-Age, Dependent-Age, Group and Sex. The census conducted by the Philippine Statistics Authority (PSA) in 2015 disclosed the composition of population in the municipality across school-age, working-age, dependent-age, group, and sex. As reported, 43 percent of the people in Tupi are school-going population, mostly at elementary level or ages 6 to 12 years. In addition, 63 percent are at working age (15 – 64 years), and 67 percent is considered as productive labor force (15 years and above). As to dependent population, 33 percent are young (0-14 years) and 4 percent are elderly stage (65 years and over). This means that 37 percent or 4 out of 10 individuals in Tupi are dependent and generally categorized as non-productive labor force.

TABLE 2-32. POPULATION COMPOSITION OF TUPI.

Age Group	Both Sexes		Male		Female	
	No.	%	No.	%	No.	%
School going population	29,874	43	15,233	51	14,641	49
Pre-school (3-5)	4,825	7	2,501	52	2,324	48
Elementary (6-12)	10,681	15	5,401	51	5,280	49
Secondary (13-18)	8,702	13	4,424	51	4,278	49
Tertiary (19-22)	5,666	8	2,907	51	2,759	49
Working Age (15-64)	43,388	63	22,597	52	20,791	48
Labor Force (15 and over)	46,165	67	23,864	52	22,301	48
Dependent Population	25,954	37	13,095	50	12,859	50
Young (0-14)	23,177	33	11,828	51	11,349	49
Old (65-over)	2,777	4	1,267	46	1,510	54

Source: PSA 2015 Census of Population

Land Area. Tupi is basically an agricultural municipality. As reported by the Municipal Planning and Development Office, 59.41 percent of its total land area are devoted to agricultural production, while 0.53 percent is categorized as agro-industrial areas. Further, less than 2 percent of the total land area was being urbanized and classified as residential (0.96%), commercial (0.15%), institutional (0.33%), and industrial (0.45%) sites. It was also noted that a considerable portion of Tupi are forest areas (32.40%), 3.09 percent are grasslands, and 0.08 percent are tourism sites.

TABLE 2-33. MUNICIPAL EXISTING LAND USED.

Land Use Categories	Area (Has)	Percent Total
Urban Use Areas		
Residential	297.54	0.96%
Commercial	46	0.15%
Institutional	102.46	0.33%
Industrial	141	0.45%
Agriculture	18,506.65	59.41%

Agro-industrial	164	0.53%
Forest	10,092.35	32.40%
Grassland	963	3.09%
Tourism	24	0.08%
River/Creeks	434	1.39%
Roads	354	1.14%
Special Uses		
Cemeteries	22	0.07%
Eco Park	3	0.01%
Total	31,150.00	100%

Source: Municipal Planning and Development Office, 2015

Income and Livelihood. Table 2-34 shows the distribution of households and population in terms of income and livelihood status. Based on the CBMS Census 2017-2018 report, 46.7 percent of the households or 52.8 percent of the entire population are living below the P10,507 poverty threshold level of the province in 2018 for a family of five. Added to that, 27.1 percent of the households and 32.4 percent of the population are with income below the food threshold. It means that current earnings of 3 out of ten individuals are not enough to meet their basic food needs and nutritional requirements set by the Food and Nutrition Research Institute (FNRI) to become socially and economically productive. Furthermore, 7.3 percent of the households or 5.8 percent of the total population in Tupi are unemployed members of the labor force.

TABLE 2-34. DISTRIBUTION OF HOUSEHOLDS/POPULATION IN TERMS OF INCOME AND POVERTY.

Indicator	Households		Population					
	Magnitude	Proportion (%)	Magnitude			Proportion		
			Total	Male	Female	Total	Male	Female
Households with income below poverty threshold	7271	46.1	31260	16000	15260	52.8	51.9	53.7
Households with income below food threshold	4279	27.1	19220	9798	9422	32.4	31.8	33.1
Households who experienced food shortage	161	1.0	636	344	292	1.1	1.1	1.0
Unemployed members of the labor force	1040	7.3	1191	533	658	5.8	3.5	11.9

Source: CBMS Census 2017-2018

Literacy. Literacy rate of Filipinos are relative to educational status. Schooling is considered by the majority as a primary avenue for upward social and economic

mobility. From the inception of United States colonial rule, with its heavy emphasis on mass public education, Filipinos internalized the American ideal of a democratic society wherein, individuals could get ahead by having a good educational background. It is nature of a Filipino parents to make remarkable sacrifices just to provide secondary and higher education to their children.

In Tupi, reading ability is considerably better among residents based on 94 percent literacy rate as recorded by PSA in 2015. The high literacy rate was attributed to 24 operational and functional public elementary schools and seven (7) secondary schools in the municipality wherein, four (4) of these are private elementary institutions and two (2) are private tertiary schools. Also, there are 55 daycare centers in the area that caters the educational needs of children ages 3 to 6 years.

Despite this overwhelming literacy rate in the municipality, its educational system and processes was still confronted by various problems such as meager financial capacity, poverty, and early marriages that boils down to 6 percent illiteracy rate. This would suggest that there is a need to further improve or implement educational programs that will address those issues to attain full literacy in Tupi in the near future.

TABLE 2-35. LITERACY RATE OF POPULATION 5 YEARS OLD AND OVER, BY SEX YEAR 2015

Indicator	Male		Female		Both Sex	
	No.	Rate %	No.	Rate %	No.	Rate %
Literate	29,530	51.38	27,944	48.62	57,474	94
Illiterate	1,983	51.44	1,872	48.56	3,855	6
Total (Population >5yr)	31,513	-	29,816	-	61,329	100

Source: PSA, 2015

Employment Status. The Department of Labor and Employment (DOLE) investigated the labor and employment statistics of Tupi in year 2015. Based on their report, the municipality has 960 unemployed and 4,290 underemployed individuals. This means that, out of 60157 total population in 2018, 8.7 percent are either unemployed or underemployed individuals.

TABLE 2-36. EMPLOYMENT STATISTICS IN TUPI.

Indicator	Quantity
Unemployed	960
Underemployed	4,290

Source: DOLE XII (2015)

Migration Pattern. Patterns of migration is usually due to increasing activity and opportunities in the urban areas. Better paid jobs in the cities, higher standard of living, and more reliable food are all full factors that attracts people to transfer in the city. People who migrate to towns and cities tend to be young and so have higher birth rates in that age range. Better medical conditions compared to the countryside means more successful births and a better life expectancy.

In the municipality of Tupi, great concentration of the populace is noticeable in the urban areas or barangays, especially in Poblacion. This is due to the presence of educational institutions or schools, markets, and job opportunities that abound in the center of this municipality.

Health. Health and nutrition are considered as an integral part of the socio-economic development. Healthy citizenry is productive citizenry and being productive, means more income. When income increases, access to the socio-economic needs is possible and when human wants are met, development follows.

The Municipal Health Office (MHO) is the lead office responsible in implementing health programs of the Department of Health. It focuses on the delivery of eight essential elements of health care, including the prevention and control of prevalent health problems; the promotion of adequate food supply and proper nutrition; basic sanitation and adequate supply of water; maternal and child care; immunization; prevention and control of endemic diseases; appropriate treatment and control of common diseases; and provision of essential drugs.

In Tupi, the MHO is composed of one medical doctor, two nurses, nineteen rural health midwives, two medical technologists, two sanitary inspectors, one dentist, one dental aide, four nursing attendant, and one pharmacist. The pool of volunteers is composed of 180 Barangay Health Workers (BHWs), and 19 Barangay Nutrition Scholars, that assisted the LGU medical personnel in the delivery of community health services.

The MHO is a two-storey building located in the urban center of the municipality at Barangay Poblacion. It also houses one dental clinic, lying-in center and the Municipal Epidemiologic Surveillance Unit (MESU). The Rural Health Unit is the frontline health office of the municipality and supported by fifteen barangay health stations.

There are two hospitals in the municipality, one private and the other one is public hospital. Both are accessible and located along the national highway. A drug-testing laboratory was also emplaced to issue certifications for applicants/persons as a requisite for employment. Also, health facilities of the municipality are supported by five pharmacies concentrated in the Poblacion area to cater to the needs of the hospitals and patients.

TABLE 2-37. HEALTH FACILITIES AND PERSONNEL (MHO, 2019)

Barangay	*Facilities*				*No. of Personnel*								
	Type	***Area (sq. meters)***	***No. of Beds***	***Physical Condition***	***Doctors***	***Nurses***	***Midwives***	***Sanitary Inspector***	***Medical Technologist***	***Dentist***	***Pharmacist***	***Others***	***Total***
Poblacion	**PUBLIC**												
	1. Rural Health Unit	*716.15*	*N/A*	*Good*	*1*	*2*	*19*	*2*	*2*	*1*	*1*	*15*	***44***
	2. Tupi RHU Drug Testing Laboratory		*N/A*	*Good*									
	3. Municipal Epidemiology		*N/A*	*Good*									

	Surveillance Unit												
	3. Roel I. Senador Memorial Hospital	*3,383.52*	*18*	*Good*									
	PRIVATE												
Poblacion	Garcia Clinic and Hospital	*1,754.13*	*24*	*Good*	*5*	*9*	*1*	*1*				*2*	***18***
All Barangays	Barangay Health Station			*Good*			*15*					*180 (BHWs)*	***15***

Morbidity and Mortality Rates. Morbidity refers to the occurrence of diseases and illness in a population and its rate is the incidence of a disease of each cause per 1,000 populations. Base on the Rural Health Units record from 2015 to 2019, Upper Respiratory Tract Infection significantly contributed to the leading causes of morbidity. Also, one of the leading causes is pneumonia, 2016 has the highest record with 433 cases. It turns out decreasing on the following year until 2018 with only 139 cases. The cause of hypertension is often not known. In many cases, it is the result of an underlying condition. The highest recorded case was in 2016 with 641 and decrease to 354 by 2019. As a consequence of this sickness, all Rural Health Personnel were trained on Integrated Childhood Illnesses. It means that they can diagnose (physically) and treat the cases.

Early detection of this illness is the key to save the lives of afflicted children and other patients. Relative to the systematic or immediate health interventions, the Health Office sustains the implementation of the program on Integrated Management of Children's Illnesses (IMCI). IMCI is a systematic approach to children's health which focuses on the whole child. This means not only focusing on curative care but also on prevention of disease. The approach was developed by United Nations Children's Fund and the World Health Organization. Prominently, some of the top causes are Dengue, Systematic viral infection, Pneumonia, Hypertension, Urinary Tract Infection and Upper Respiratory Tract Infection.

The MESU is responsible in disease surveillance and response system by providing timely, accurate and relevant action to reduce mortality, morbidity and disability caused by communicable diseases and other conditions in the locality.

TABLE 2-38. LEADING CAUSES OF MORBIDITY (2015-2019)

	LEADING CAUSES OF MORBIDITY	2015	2016	2017	2018	2019
1	Upper Respiratory Tract Infection	916	1,355	83		1,846
2	Dengue	505	1,327			
3	Pneumonia	426	433	164	139	
4	Fever/Systemic Viral Infection	415	207	36	307	346
5	Hypertension	358	641	72	122	354
6	Diarrhea all forms	285	362	69	91	

7	Pulmonary Tuberculosis	161	258	68	69	
8	Skin disease/dermatitis	129	223			204
9	Dental & Peridontal	98				
10	Wound/Injuries	90		25	56	105
11	Influenza-like illness		1,140		843	
13	Influenza (fever, headache, cough cold)		184	352		
14	Animal Bites			23	61	142
15	Urinary Tract Infection			22		406
16	Bronchial Asthma				71	222
17	Bronchitis				58	137
18	Acute Gastroenteritis					137

Source: Rural Health Unit (2015-2019)

As to mortality, cardiovascular diseases (CVDs), hypertension and pneumonia are the leading causes of death in this locality. Hypertension remained the highest recorded mortality case for three consecutive years, from 2016, 2017 and 2019. On the other hand, cardiovascular diseases (CVD) include ischemic heart diseases, hypertension, stroke and rheumatic heart diseases. The etiology and pathophysiology of these diseases is complex, but it is known that major risk factors include unhealthy lifestyles and behaviors and a complex interaction between environmental and genetic factors. Ageing populations and rapidly changing lifestyles (in particular, tobacco smoking, unhealthy diets, and harmful use of alcohol and lack of exercise or physical inactivity) mean that cardiovascular diseases are increasing in this part of this Region. The RHUs intervention will be the prime initiator to disseminate better lifestyle among the local residents.

Hypertension contributes to increased incidence of stroke. Hypertension has been a recurrent cause of death from 2012 to 2019. According to the 2016 Mortality Report for submission to the Provincial Health Office (PHO), this is usually common from the age bracket from 40 to 65 years (and above) and affects mostly the female Comprehensive Development Plan 2020-2025 65 gender. Pneumonia cases also one of the causes that lead to death of some patients. This also occurred from under the 1 age brackets with one male casualty. Vehicular accidents have been a growing issue with a total of 88 casualties from 2015 to 2019 even with the imposition of an ordinance regulating the speed limit in the locality.

TABLE 2-39. LEADING CAUSES OF MORBIDITY (2015-2019)

LEADING CAUSES OF MORTALITY		2015	2016	2017	2018	2019
1	Hypertension	67	49	27	26	
2	Pneumonia	37	28	43	19	30
3	Vehicular accidents/severe hemorrhages	37	7	8	7	27
4	Chronic Renal Failure	15	15	18		
5	Myocardial Infarction	13		8	6	16
6	End Stage Renal Failure	13			7	
7	Diabetes Mellitus	10	12	15	5	14

8	Congestive Heart Failure	7	11			
9	Pulmonary Tuberculosis	5				
10	Cardiac Arrest	4				
11	Gunshot		10		24	
12	Acute Renal Failure		6			
13	Bronchial Asthma		6			
14	Cancer all forms		3	6		30
15	Stroke			28		
16	Bleeding Peptic Ulcer			6		8
17	Congenital Diseases			9		
18	Diabetes Mellitus					
19	Pulmonary Diseases				3	
20	Extra Pulmonary Diseases				3	
21	Abortion				3	
22	Stroke HTN					52
23	Chronic Kidney Disease					12
24	Chronic Obstructive Pulmonary Disease					6

Source: Rural Health Unit (2015-2019)

When it comes to nutritional status, the prevalence and depth of poverty in the municipality are now declining through accelerated economic growth. However, social indicators still vary dramatically across the municipality's confines according to poverty levels, indicating that local development continues to be dragged down by the situation of the poor. The thrust and direction of the Nutrition Program is to reduce the incidence of malnutrition among vulnerable group of the municipality. Supplemental Feeding had been a regular program of the MSWDO. Aside from the LGU fund, the provincial government, national line agencies (DECS), Mahintana Foundation, and DOLEFIL, provided food assistance and other supplementary feeding to diverse ages of children identified with very low nutritional status and malnourished stage of condition. The MSWDO conducted a supplemental feeding program benefitting day care children of different barangay. About 48.42 percent are male children; while, 51.58% are female. Under the 4Ps Program, about 575 children received supplemental feeding. About 194 indigenous people's children also have

benefited from this program from the Municipal Social Welfare and Development Office (MSWDO).

TABLE 2-40. MALNOURISHED CHILDREN FOR THE PAST FIVE YEARS, (2015-2019)

Degree of Malnutrition	Number of Children				
	2015	2016	2017	2018	2019
Underweight	386	351	302	201	329
Severely Underweight	23	32	48	29	73
Overweight	42	38	38	21	139
Total	451	421	302	251	541

Source: Municipal Health office, Municipal Nutrition Council

The overwhelming recognized causes of malnutrition are the low educational level of household members. Tied with this are erroneous habits and thinking, they hinder the right choices in meal planning and preparation, just like limited skills and knowledge negatively affect children. The financial conditions - above all - of the family totally affect finances for providing nutritious foods. Supplemental Feeding had been a regular program of the MSWDO. Nongovernmental organizations (e.g., Mahintana Foundation and DOLEFIL) provide food assistance and other supplementary feeding to diverse ages of children identified with very low nutritional status and malnourished condition. Private firms like UNILEVER, Mead Johnson and the DSWD funded and conducted meal feeding activities to numerous children in various barangays. From 2016 to 2018, the underweight declined. However, there was an increase of severely underweight children from 2017 and 2019.

Waste Management and Disposal System. To maintain proper waste disposal and management in the municipality, a Memorandum of Agreement was signed between the LGU of Polomolok and LGU of Tupi last September 9, 2009 to accommodate and use the SLF of Polomolok. Presently, the LGU of Tupi maintains a Residual Containment Area (RCA) and composting facility as transfer stations. Collections points were aptly called Material Recovery Facility (MRF).

The LGU maintains a one (1) hectare-controlled dumpsite at Barangay Acmonan. The said dumpsite was converted to a controlled one in 1994. At present, the LGU has already converted its controlled dumpsite to Residual Containment Area (RCA) for collected residual wastes. Thrash were sorted out and the remaining refuse were transported to a sanitary landfill in the municipality of Polomolok.

Table 2-41shows the volume of waste generated by the municipality. Around 15 cu. meters of local garbage was collected per week and were disposed in the SLF of Polomolok. Barangay Poblacion is the only locality served by regular garbage collection services; and few localities enjoys or benefits from the LGU's garbage collection services by schedule. Households were told to segregate their waste into four types-biodegradable, recyclable, residual and special wastes. Thrash were pack inside garbage bags and were collected on designated schedule.

TABLE 2-41. METHODS OF SOLID WASTE DISPOSAL

Methods	Quantity (Total Municipal Solid Waste Generated)	No. Of Household Served	Agency Responsible

1. Collected and disposed to:			
Open Dump	-	-	-
Controlled Dump	-	-	-
Sanitary Landfill	15 cubic meters/week	134	LGU-TUPI
2. Composting	15 cubic meters/week		
3. Recycling	5 cubic meters/week		
4. Not Collected:			
Burned			
Dumped in Individual open pit (not Burned)			
5. Others			

Source: Solid Waste Management Office (2018)

Transportation and Communication. The Tupi Transport Terminal has its daily trip to General Santos City and Koronadal City 24 hours daily. The estimated time allotment from Tupi to General Santos City and vice versa is only 45~60 minutes without traffic. From General Santos City, there are trips to Tupi, the PUVs are available at the mall terminals. General Santos International Airport is 1 hour away from Tupi's town proper by using the newly constructed General Santos Diversion Road to avoid heavy traffic in General Santos City.

When it comes to communication, the Philippine Long Distance Telephone Company provides fixed line services. Wireless mobile communications services are provided by Smart Communications, Globe Telecommunications and Sun Cellular.

Profile of Project-Affected People

Aside from secondary data, the team also collected primary data to assess the personal profile of the respondents, the economic profile of the households, its housing condition, access to education, health services and information, and the community's perception to the proposed project. The results of the survey are presented in this section.

Age. It refers to the actual number of years of existence of household-respondents. Age of the respondents is one of the most important characteristics in understanding their views about the particular problems. As shown in Table 2-42, youngest household-respondent is 17 years old while the oldest respondent is 82 years old, with an average of 43 years.

TABLE 2-42. AGE OF HOUSEHOLD-RESPONDENTS OF THE STUDY

Particular	Age (Years)
Youngest	17
Oldest	82
Average	43

Gender. Table 2-43 shows the distribution of respondents according to the biological characteristics of the respondents of either male or female. As discovered, the majority of them (70%) are female while the rest (30%) are male. The supremacy of women as respondents of the study is crucial as women influences the decisions of the family, hence their views and opinions are crucial in constructing strategies in ensuring community's acceptance of the project.

TABLE 2-43. DISTRIBUTION OF RESPONDENTS ACCORDING TO GENDER

Gender	Frequency	Percentage
Female	70	70
Male	30	30
Total	100	100

Place of Birth. The majority of the respondents (55%) were born within the Barangay under study. It simply means that most of the residents interviewed are local residents of the said area. Meanwhile, 37 percent were born outside of Tupi, and only 8 percent were born in other barangays of Tupi.

TABLE 2-44. DISTRIBUTION OF RESPONDENTS ACCORDING TO PLACE OF BIRTH

Place of Birth	Frequency	Percentage
Within the Barangay	55	55
Outside Tupi	37	37
Other Barangay within Tupi	8	8
Total	100	100

Civil Status. Majority of the respondents were already married comprising of about 71% or equivalent to 71 out of 100 who participated the perception survey. This simply implies that most of the respondents really settled their family in Tupi despite that some of them came from other neighboring places. On the other hand, other respondents are single (23%), widowed (5%), and only one (1%) is separated.

TABLE 2-45. DISTRIBUTION OF RESPONDENTS ACCORDING TO CIVIL STATUS

Civil Status	Frequency	Percentage
Married	71	71
Single	23	23
Widowed	5	5
Separated	1	1
Total	100	100

Ethnic origin. Ethnicity is a social category of people's identity based on similarities of ancestry, language, history, society, culture or area. In this study, it was revealed that a massive number of household-respondents are Cebuanos (83%). Aside from Cebuanos, some of the respondents are Ilonggos (11%), and Ilocanos (2%), while 4 percent belonged to other ethnic groups of B'laan and Aklanon.

TABLE 2-46. DISTRIBUTION OF RESPONDENTS ACCORDING TO ETHNIC ORIGIN

Ethnic Origin	Frequency	Percentage

Cebuano	83	83
Ilonggo	11	11
Others	4	4
Ilocano	2	2
Total	100	100

Religion. The religion plays an important part in the progression of social and economic development. In most societies, especially in developing countries, religious beliefs strongly shape the political and economic organizations, and hence either alleviate or hinder overall development of projects like the proposed Britannika golf course. Based on the survey, most of the household-respondents (89%) are believers of Jesus Christ and were members of Roman Catholic religious organization. On the other hand, four respondents (4%) are affiliated to Seventh Day Adventist, only one (1%) is a member of Iglesia ni Cristo religious organization, while others (6%) are members of another religious group like Born Again, Evangelical Methodist Church, Global Missions and Islam.

TABLE 2-47. DISTRIBUTION OF RESPONDENTS ACCORDING TO RELIGION

Religion	Frequency	Percentage
Roman Catholic	89	89
Others	6	6
Seventh Day Adventist	4	4
Iglesia ni Cristo	1	1
Total	100	100

Years of Residency. It is defined as the number of years an individual resided in the area. In the 100 household respondents under study, it was revealed that respondents are longtime residents of the area with average residency of 28 years. The earliest residency is 1 year while the longest is 70 years. This means that the respondents have a depth of knowledge and awareness on recent and recurring issues and problems in the barangay. These are important inputs in crafting a need-based social development programs for the directly affected households.

TABLE 2-48. YEARS OF RESIDENCY OF HOUSEHOLD-RESPONDENTS

Particular	Years of Residency
Average	28
Longest	70
Earliest	1

Primary Source of Income. Income, on this study refers to the gross earnings of the respondents on a monthly basis. As illustrated in Table 2-48, a greater portion of the households' income come from their profits working as a farmer (41%). Meanwhile, 16 percent of them are private employee, 12 percent are working in the government, 6 percent declared that they have no source of income at all, and others (25%) are dependent on their own business.

TABLE 2-49. DISTRIBUTION OF RESPONDENTS ACCORDING TO PRIMARY SOURCE OF INCOME

Primary Source of Income	Frequency	Percentage
Farmers	41	41

Others	25	25
Private Employee	16	16
Government Employee	12	12
No Source of Income	6	6
Total	100	100

Personal Gross Monthly Income- The study revealed that most of the respondents (44%) are earning less than five thousand pesos a month while 7 percent makes P15,001 - P20,000 per month. This monthly income reflects the fact that most of the respondents were able to meet his/her monthly basic requirements to stay out from poverty, which is 2,159 pesos a month (PSA, 2018). Thus, they were able to meet their most basic personal food and non-food needs.

TABLE 2-50. DISTRIBUTION OF RESPONDENTS ACCORDING TO PERSONAL GROSS MONTHLY INCOME

Personal Gross Monthly Income	Frequency	Percentage
Less than P5,000	44	44
P5,001 - P10,000	30	30
P10,001 - P15,000	14	14
P15,001 - P20,000	7	7
More than P20,000	5	5
Total	100	100

Household Structure

The characteristics of the project-affected households are discussed on this section. The structure of the households is described based on its size and gross monthly family income.

Household Size. Table 2-51 specifies the household size of the respondents. It refers to the number of members in a household who are typically sharing the house, the budget, and the responsibilities for supporting and maintaining the household unit. In the study, it was discovered that most of the respondents (44%) are composed of 3 to 4 members while few of them (11.1%) are made up of 7 members or more. The mean size of project-affected households is 4 persons which is normal structure of typical Filipino family (USAID, 2008; PSA, 2015). The number of households affects the income elasticities, purchasing power, and the quality of life of the respondents. This would help in explaining the acceptability of the community towards the project in consideration of potential social and economic opportunities may create in the future.

TABLE 2-51. DISTRIBUTION OF RESPONDENTS ACCORDING TO HOUSEHOLD SIZE

Household Size	Frequency	Percent
2 Members & Below	14	14
3 – 4 Members	44	44
5 – 6 Members	28	28
7 Members & Above	14	14

Total	100	100

Number of Working Household Members. Table 2-52 displays the number of working household members of the respondents. As stated, majority of them or 63 percent have only one (1) household member who are currently working and earning an income. 29 percent have two working family members, while 3 percent have three working family members. However, the worst part is some of them or 5 percent of the respondents declared to have unemployed household members. According to them, their family members were temporarily or permanently terminated from their work due to COVID-19 crisis which forces some business establishments to shut down the operations.

TABLE 2-52. DISTRIBUTION OF RESPONDENTS ACCORDING TO THE NUMBER OF WORKING HOUSEHOLD MEMBERS

Number of Working Household Members	Frequency	Percentage
None	5	5
1 member	63	63
2 members	29	29
3 members	3	3
Total	100	100

Household's Gross Monthly Income. Table 2-53 presents the monthly income of the households. It refers to the sum of gross monthly income of the entire working households. As revealed, most of the respondents (34%) reported to have both a monthly gross household income of 10,001-15,000 pesos and P5,001 - P10,000 pesos while some (9%) have earned a combined income of 15,001-20,000 pesos a month. This amount would imply that the households were able to meet the minimum income to satisfy the basic food needs (food threshold), that is no less than 7,337 pesos in a month for a family of five. In addition, the household-respondents were able to meet the monthly basic requirements to stay out of poverty, which is 10,797 pesos (PSA, 2018).[1]

TABLE 2-53. DISTRIBUTION OF RESPONDENTS ACCORDING TO GROSS MONTHLY HOUSEHOLD INCOME

Household's Gross Monthly Income (PhP)	Frequency	Percentage
< 5,000	34	34
5,001 - 10,000	34	34
10,001 - 15,000	16	16
15,001 - 20,000	9	9
> 20,000	7	7
Total	100	100

House Structure

[1] PSA, 2018. Poverty Estimates of Davao Region, Retrieved at http://rsso11.psa.gov.ph/article/2018-poverty-estimates-davao-region.

The project-affected communities were also investigated in terms of house ownership and structure. The results are presented on this section.

Years of House Existence/Established. The study shows that respondents' houses are existed in the area for 21 years, as average. The oldest house was constructed 67 years ago, while the newest houses are existing in the area for less than a year.

TABLE 2-54. DISTRIBUTION OF RESPONDENTS ACCORDING NUMBER OF YEARS THE HOUSE WAS ESTABLISHED

Number of Years	Frequency
Average	21
Longest	67
Earliest	Less than 1 year

House Ownership. Majority or ninety-three percent of the respondents owned a house. On the other hand, some of them are renters (2%), while others are occupying for free (2%).

TABLE 2-55. DISTRIBUTION OF RESPONDENTS ACCORDING TO THE HOUSE OWNERSHIP

House Ownership	Frequency	Percentage
Owner	93	93
Occupying for free	5	5
Renter	2	2
Total	100	100

Source of Water. Table 2-55 shows the sources of potable water of the respondents. As shown, majority or 61 percent of the respondents are connected to Municipal water supply system. Meanwhile, 15 percent are dependent on spring as source of potable water, 11 percent depends deep well, while others (13%) are relying on other sources like rain water, potable water of the BLGU, and local water refilling stations. The data reflects the need to improve the community's access to safe and stable water supply as some of them are still relying on underground water through manual or submersible well pumps.

TABLE 2-56. DISTRIBUTION OF RESPONDENTS ACCORDING TO THE SOURCES OF POTABLE WATER

Sources of Potable Water	Frequency	Percentage
Municipal Water Supply	61	61
Spring	15	15
Deep well	11	11
others	13	13
Total	100	100

Access to Education, Health Care Services, and Information

Status of education, health, and sanitation of project-affected communities are also crucial in understanding the needs of PAPs. The results of descriptive analysis are presented on this section.

Educational Attainment. It refers to the level of education attained by the respondents. As to the educational background, most of the respondents (42%) have attended secondary level of education, 39 percent attended tertiary level of education while 13 percent attained primary level of education. Also, two (2%) of the respondents have earned technical and vocational courses. Lastly, 4 percent of them was noted to have no formal schooling.

TABLE 2-57. DISTRIBUTION OF RESPONDENTS ACCORDING TO EDUCATIONAL ATTAINMENT

Educational Attainment	Frequency	Percentage
Highschool	42	42
College	39	39
Elementary	13	13
No Formal Schooling	4	4
Vocational (Tech/Voc)	2	2
Total	100	100

Number of Household Members Enrolled in Pre-School. The educational status of household members was also considered in the study. As displayed in Table 2-58, three quarters of the respondents (76%) do not have family members currently enrolled in pre-school. However, 24 percent of them have 1 preschooler.

TABLE 2-58. DISTRIBUTION OF RESPONDENTS ACCORDING TO THE NUMBER OF HOUSEHOLD MEMBERS ENROLLED IN PRE-SCHOOL

Number of Pre-schoolers	Frequency	Percentage
None	76	76
1 Member	24	24
Total	100	100

Number of Household Members Enrolled in Elementary. Table 2-59 shows the distribution of respondents with members enrolled in elementary education. As observed, majority of them (60%) have no family members currently enrolled in elementary. Meanwhile, 23 percent of the respondents have 1 member presently enrolled in elementary education. Also, 14 percent have 2 members, and 3 percent have 4 members enrolled in elementary education.

TABLE 2-59. DISTRIBUTION OF RESPONDENTS ACCORDING TO THE NUMBER OF HOUSEHOLD MEMBERS ENROLLED IN ELEMENTARY

Number of Enrolled Members in Elementary	Frequency	Percentage
None	60	60
1 Member	23	23
2 Members	14	14
3 Members	3	3
Total	100	100

Number of Household Members Enrolled in Highschool. Table 2-60 presents the distribution of respondents according to the number of households enrolled in high school. As stated, 61 percent of the respondents are found to have no family members taking secondary level of education at present. In the meantime, 25 percent of them declared 1 member, 11 percent have 2 members, only 1 (1%) has 3 members and lastly, 2 percent declared 4 members of the household currently enrolled in high school.

TABLE 2-60. DISTRIBUTION OF RESPONDENTS ACCORDING TO THE NUMBER OF HOUSEHOLD MEMBERS ENROLLED IN HIGHSCHOOL

Number of Enrolled Members in Highschool	Frequency	Percentage
None	61	61
1 Member	25	25
2 Members	11	11
3 Members	1	1
4 Members	2	2
Total	100	100

Number of Household Members Enrolled in College. The study discovered that the majority (76%) of the respondents do not have family members currently enrolled in college. Still, 21 percent of them have 1 member attending college and only 3 percent stated that 2 members of the household currently enrolled in college.

TABLE 2-61. DISTRIBUTION OF RESPONDENTS ACCORDING TO THE NUMBER OF HOUSEHOLD MEMBERS ENROLLED IN COLLEGE

Number of Enrolled Members in College	Frequency	Percentage
None	76	76
1 Member	21	21
2 Members	3	3
Total	100	100

Type of Educational Assistance. As to the type of educational support, it was found out that more than half of these enrolled household members (75%) were supported by their parents, 2 percent are supported by their relatives, and 2 percent avail a government scholarship. In contrast, 21 percent have declared that no members of the household are currently studying.

TABLE 2-62. DISTRIBUTION OF RESPONDENTS ACCORDING TO THE TYPE OF EDUCATIONAL SUPPORT

Educational Support	Frequency	Percentage
Parents	75	73
Others	21	14
Relatives	2	2
Government Scholar	2	2
Total	100	100

Household Members with Illness. Table 2-63 details the distribution of respondents with family member/s suffering from illness. As perceived in the table, more than half of them (52%) have no family members suffered from any type of illness. Instead, 20 percent declared 1 member with illness, 15 percent have 2 members with illness, 6 percent have 3 members suffered from illness, and 7 percent have 4 members suffered from illness.

TABLE 2-63. DISTRIBUTION OF RESPONDENTS ACCORDING TO THE NUMBER OF HOUSEHOLD MEMBERS WITH ILLNESS

Number of Household Members with Illness	Frequency	Percentage
None	52	52
1 member	20	20
2 members	15	15
3 members	6	6
More than 4 members	7	7
Total	100	100

Type of Illness. Table 2-64 enumerates the type of illness experienced by the family members of the respondents. As shown, most common illness is cough and cold (37%), followed by fever (36%), diarrhea (2%), and other illnesses (25%) like diabetes, foot pain and *mayoma*. In contrary, 21 percent of the respondents said that they did not experience any type of illness.

TABLE 2-64. DISTRIBUTION OF RESPONDENTS ACCORDING TO TYPE OF ILLNESS

Type of Illness	Frequency	Percentage
Cough and Cold	37	37
Fever	36	36
Others	4	4
Diarrhea	2	2
No illness	21	21
Total	100	100

Place of Medication. In relation to type of illness, it was revealed that majority of the respondents who suffer health illness are practicing self-medication (41%). Some of them sought help from the professionals in private doctors or hospitals (4%) and government hospital (2%), while only one respondent or 2 percent sought medical help in the Barangay Health Center. However, 38 percent of the respondents have no response whereas 13 percent admit that they did not experience any type of illness

TABLE 2-65. DISTRIBUTION OF RESPONDENTS ACCORDING TO THE PLACE OF MEDICATION

Place of Medication	Frequency	Percentage
Self-Medication	41	41
No Response	38	38
No Illness	13	13
Government Hospital	4	4
Private Doctor/Hospital	2	2

Barangay Health Center	2	2
Total	100	100

Manner of Garbage Disposal. Most of the respondents (42%) dump their garbage in the garbage can, 29 percent throw the garbage in the compost pit, 14 percent said that the Barangay Local Government Unit regularly collected their garbage, once in a week, 3 percent have no response, while others (12 %) did not follow proper disposal by just burning their garbage or throw it in vacant lots.

TABLE 2-66. DISTRIBUTION OF RESPONDENTS ACCORDING TO THE MANNER OF GARBAGE DISPOSAL

Manner of Garbage Disposal	Frequency	Percentage
Garbage can	42	42
Compose pit	29	29
BLGU regular collection	14	14
Others	12	12
No Response	3	3
Total	100	100

Sources of Information. The community considered Television (TV) as their main source of information (88%). Additionally, more than half of the respondents are still using two-way radio (57%), internet (37%) and newspapers (10%) as means of acquiring information. This finding would suggest that mass media like TV and two-way radio broadcast can be utilized in intensifying the information, education, and communication campaign to improve community's awareness, understanding, and acceptance of the proposed project.

TABLE 2-67. DISTRIBUTION OF RESPONDENTS ACCORDING TO SOURCES OF INFORMATION

Sources of Information	Frequency	Percentage
TV	88	88
Two-way Radio	57	57
Internet	37	37
Newspaper	10	10
Total	100	100

Common Issues and Problems Encountered. Part of the survey is the investigation of issues and problems encountered by the respondents. The main social problem currently experienced by the respondents is Unemployment (76%). This is followed by poverty and hunger (49%), lack of capital (42%), poor road condition (17%), lack of potable water supply (17%), lack of facilities and supplies in the hospital (8%), and poor drainage condition (5%). Almost 16 percent of the respondents also reported other issues and problems such as unfair distribution of government assistance, several children stop schooling, absence of barangay vehicles for transportation and emergency, non-access to electricity and power supply, and absence of recreational facilities (ex. Basketball court).

TABLE 2-68. DISTRIBUTION OF RESPONDENTS ACCORDING TO ISSUES AND PROBLEMS ENCOUNTERED

Issues and Problems	Frequency	Percentage

Unemployment	76	76
Poverty and hunger	49	49
Lack of capital	42	42
Poor road condition	17	17
Lack of potable water supply	17	17
Lack of facilities and supplies in the Hospital	8	8
Poor drainage condition	5	5
Others	16	16
Total	222*	100

*Multiple responses

Relative to the issues and problems encountered, important solutions and recommendations were collected from the respondents. Based on the results, 47 percent of the respondents suggested that to address the problems in the community specially the top three issues and problems run into (Unemployment, Poverty and hunger, Lack of capital), the government must provide livelihood programs and cash aids. Next suggestion is the respondent's instigation to seek for a job (23%), repair and maintenance of roads (15%), provide stable source of potable water (15%), and others (9%) suggest government to conduct feeding program, education and health projects, additional transformers for electricity and power supply and construction of recreational facilities like basketball court.

TABLE 2-69. SUGGESTED SOLUTIONS TO ADDRESS THE ISSUES AND PROBLEMS

Important solution to address the problems in the community	Frequency	Percentage
Government Programs (Livelihood programs and cash aide)	47	47
Find a Job	36	36
Repair and maintenance of roads	23	23
Provide stable source of potable water	15	15
Others	9	9
Total	120*	100

*Multiple responses

Awareness on Britannika Golf Course Project. Awareness is the ability to be cognizant of the introduced technology, innovations or any development. It is considered as starting point to influence adoption decision towards the need of any developmental change such like the proposed Britannika Golf Course Project. Based on the survey, it was discovered that all of household-respondents (100%) are aware of proposed Britannika Golf Course Project. It implies that the awareness of the community is exceptional when it comes to newly introduced project proposed in near their vicinity.

TABLE 2-70. DISTRIBUTION OF RESPONDENTS ACCORDING TO THE AWARENESS ON THE PROPOSED PROJECT.

Awareness	Frequency	Percentage
Yes	100	100
No	0	0

Total	100	100

Sources of Information. In relation to the data presented in Table 2-71, the respondent's 100 percent awareness can be explained by their means of gathering information. Out of fully aware respondents, 39 percent heard it through hearsay/gossips, 39 percent were informed through the barangay officials, while others (22%) were informed through internet, from relatives and other people or its neighbors.

TABLE 2-71. DISTRIBUTION OF RESPONDENTS ACCORDING TO SOURCES OF INFORMATION

Sources of Information	Frequency	Percentage
Gossips	39	39
Barangay	39	39
Others	22	22
Total	100	100

Community's Acceptance of the Project. The decision to establish the proposed project is somehow affected by the community's preferences and genuine support. Based on the conducted perception survey, almost all of the respondents (99%) are willing to accept and approved the implementation of the project. Meanwhile, only one respondent (1%) is not willing to accept the project as he/she anticipated some negative impacts specially on employment.

TABLE 2-72. DISTRIBUTION OF RESPONDENTS ACCORDING TO PROJECT ACCEPTANCE

Acceptance of the Project	Frequency	Percentage
Yes	99	99
No	1	1
Total	100	100

Hoping to find a probable source of income, most of the respondents (52%) believed that the project is advantageous in terms of employment opportunities. 24 percent believed that the proposed project will become a possible tourist spot which result to the development of the community. 15 percent hopes that it will improve the community's waste management disposal and others (9%) expected business set-up and clean surrounding.

TABLE 2-73. DISTRIBUTION OF RESPONDENTS ACCORDING TO REASON OF PROJECT ACCEPTANCE

Reason of Acceptance	Frequency	Percentage
Provide employment	52	52
Potential Tourist Spot	24	24
Improve proper waste disposal	15	15
Others	9	9
Total	100	100

Community's Support to the Proposed Project. The decision to support the proposed project is somehow affected by the community's preferences. Based on the survey,

almost all of the respondents (85.19%) are willing to support the proponent in the implementation of the proposed project. The high support can be explained by the positive thoughts of the community towards the project. Only one respondent (1%) is still on the opposing side because of the disadvantages it will create in the future.

TABLE 2-74. DISTRIBUTION OF RESPONDENTS ACCORDING TO PROJECT SUPPORT

Support to the Project	Frequency	Percentage
Yes	99	99
No	1	1
Total	100	100

Impact Assessment and Mitigation Measures

The analysis of primary and secondary data leads to the identification of project's impacts to the affected people. The list of impact and corresponding mitigation measures are presented below:

TABLE 2-75. LIST OF IMPACTS AND CORRESPONDING MITIGATION MEASURES

List of Key Impacts	Phase Occurrence				Discussion/Options for Prevention, Mitigation or Enhancement
	Pre-Construction	Construction	Operation	Abandonment	
Negative perception towards the project or the social acceptability of the community	√				Extensive IEC campaign and community level consultations to enhance awareness, attitude, and acceptability among stakeholders
Local employment generation	√	√	√		Priority hiring of qualified local workforce Conduct of specialized training program of the host communities in enhance competencies
Proliferation of micro, small, and medium enterprises	√	√	√		Prioritize purchasing of local items, if applicable, within the host communities
Limited employment opportunities	√	√	√		Provision and development of alternative livelihood projects or programs especially for

					youth, women, PWDs, and senior citizen
Fear of siltation, flooding, and other hazards	√	√	√	√	Creation and implementation of disaster risk management plan Conduct IEC in disaster risk management Community seminars/training on disaster risk preparedness, mitigation, adaptation, response, recovery, and rehabilitation Support BDRRMC in the provision of equipment and supplies in responding to and recovery of disaster-affected communities
Threat to health due to dust generation / dispersion	√	√	√		Creation and implementation of health-related programs and services for the host communities Implementation of dust suppression techniques like covering of trucks loaded with spoils/filling materials when in transit, pre-wetting or watering of road surface
Stress due to noise and air pollution during civil works		√	√		Proper and regular maintenance of heavy equipment Installation of mufflers Proper work schedule at daytime
Fear of road accidents and traffic congestions		√	√	√	Creation of road network and traffic management plan Provision of speed limits in major roads and built-up areas

					Establishment of construction buffer zones and containment barriers Coordination with concerned government agencies like DPWH, Municipal Traffic Management Office, and LGUs
Increase risk of occupational safety		√	√		Creation of occupational safety plan Wearing of proper PPE at workplace Establishment of first-aid station, and posting of safety signages and measures in strategic areas of workplace
Fear of hitting by golf balls			√		Creation of set-back and buffer zones Provision of health and property insurance packages Formulation and imposition of local house rules and other safety protocols like non-use of driver club in Holes #3 Adjustment of distance by 30 yards
Influx of migrant workers and its families leading to increase in crime incidence	√	√	√		Prioritize hiring of qualified manpower Creation of safety and security plan Proper coordination with local peace keeping force like PNP, etc.
Termination of workers				√	Advance notice shall be given to workers Provision of compensation packages

2.4.5. Impact Management Plan

The table below presents the significant socio-economic impacts of the project. It includes stress due to noise in nearest receptor, and workers; respiratory problems due to dust and unpleasant odor; occupational health hazards and risk of workers and community; road accidents and traffic congestion; influx of population due to in-migration of workers and families creating peace and order disturbance; increase income and employment opportunities; increase government revenue generation from taxes and permits of proliferating business enterprises including the project; and reduction and eventual termination of employees and government income. The corresponding strategies and actions to be considered in preventing, mitigating, or enhancing the negative or positive impacts are elaborated in Table 2-76.

TABLE 2-76. IMPACT MANAGEMENT PLAN FOR THE PROPOSED BRITTANNIKA GOLF COURSE PROJECT

Project Phase / Environmental Aspect (Project Activity Which Will Likely Impact the Environmental Component)	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement	Responsible Entity	Cost	Guarantee / Financial Arrangements
I. Construction Phase						
Transportation/ Mobilization of heavy equipment	People	Stress due to noise in nearest receptor (residential area), and workers	- Proper scheduling of noisy activities during day time - Provision of ear mufflers to workers operating noisy equipment	Brittannika Golf Course, Inc.	Part of operation costs	EMP, SDP, and ECC
Civil works	People	Respiratory problems on dust generation as a result of increased movement of heavy equipment on site and in delivery of materials	- Regular spraying of water in active construction areas - Provision of health and safety programs	Brittannika Golf Course, Inc.	Part of operation costs	EMP, SDP, and ECC

	People	Occupational health hazards and risk of workers and community	- Provision of PPE to every personnel - Conduct of safety orientation and training - Implementation of proper housekeeping - Develop and implement safety and health program for workers and impact communities	Brittannika Golf Course, Inc.	Part of operation costs	EMP, SDP, and ECC
	People	Road accidents and traffic congestion	- Regular maintenance of equipment and motor vehicles - Conduct of road safety orientation and training - Creation of road safety and management plan - Impose speed restrictions - Assistance to the LGU on traffic management	Brittannika Golf Course, Inc., MTTMO, & BLGU	Part of operation costs	EMP, SDP, and ECC
	People	Income & employment generation	- Prompt payment of taxes to the local and national government	Brittannika Golf Course, Inc.	Part of operation costs and SDP fund	EMP, SDP, and ECC

			- Priority hiring of qualified local workforce			
II. Operation Phase						
Daily operations	People	Emission from genset, vehicles and other diesel generating equipment	- "Turn Off Engine while Parked" sign shall be posted at the parking area. - Regular maintenance of generator set and diesel operated equipment. - Ensure that appropriate control facilities are installed and being used to reduce emission and help reduce the noise.	Environmetal Unit of Brittannika Golf Course, Inc.	Part of operation cost	Proponent EMP, ECC
	People	Peace and order disturbances due to competition, and cultural differences of migrant workers and its families	- Values orientation seminars to workers and community - Conduct of social cohesion-promoting activities - Provision of security officer	Brittannika Golf Course, Inc., PNP, and LGU	Part of operation costs and SDP fund	EMP, SDP, and ECC

			- Formulation and implementation of safety and security plan - Proper coordination with the local police. - Emergency numbers shall be posted at strategic places so assistance can easily be summoned in cases of unlikely situations. - Conduct trainings shall be done to orient employees on proper things to do in case someone would attempt to do untoward things.			
	People	Influx of population due to in-migration of workers and families	- Priority hiring of qualified local workforce	Project Manager, HR Manager, Facility Administrator, and Security Officer of Brittannika	Part of operation costs	EMP, SDP, and ECC

				Golf Course, Inc.		
	People	Occupational health hazard and accidents	- Creation and implementation of occupational safety and health plan and programs	Brittannika Golf Course, Inc.	Part of operation costs	EMP, SDP, and ECC
	People	Income and employment generation	- Priority hiring of qualified local workforce	Brittannika Golf Course, Inc.	Part of SDP Fund	EMP, SDP, and ECC
	People	Increase government revenue generation from taxes and permits of proliferating business enterprises including the project	- Prompt payment of taxes to the local and national government - Priority purchase of inputs in local enterprises (if available)	Brittannika Golf Course, Inc., BIR, & Municipal Economic Enterprise Unit	Part of SDP Fund	EMP, SDP, and ECC
	People	Fear of landslides/siltation and other hazards	- Seminars/training for communities on Disaster Risk Preparedness and Mitigation - Provision of equipment and aid in response and	Environmental Unit of Brittannika Golf Course, Inc.	Part of operation costs	EMP, SDP, and ECC

			Recovery of affected communities			
	People	Traffic congestion due to additional load due to influx of tourists/ visitors	- Posting of signage at strategic areas to direct the tourists/visitors to use the alternate - Ensure that the parking area is sufficient especially during scheduled golf league/tournament	Brittannika Golf Course, Inc.	Part of operation costs	EMP, SDP, and ECC
		Increase in demand for health services in the area Threat to health due to generation/ dispersion of dust	- The project is provided with clinic to immediately respond to minor health care needs of the tourists/ visitors/ employees. - Hiring of health personnel to attend to those who need medical assistance - In cases of untoward incidents and severe situations, the person who needs hospital care shall be brought immediately at the nearest hospital.	Brittannika Golf Course, Inc.	Part of operation costs and SDP fund	EMP, SDP, and ECC

III. Abandonment Phase						
Cease of Operation	People	Reduction and eventual termination of employees	- Crafting and implementation of abandonment plan particularly the retrenchment packages - Crafting and implementation of labor policies and programs	Brittannika Golf Course, Inc.	To be determined	
	People	Termination of government revenues due to terminated taxes, permits, and other agreements	- Extensive IEC prior to abandonment - Crafting and implementation of sustainable social development programs - Crafting and implementation of abandonment plan	Brittannika Golf Course, Inc.	To be determined	ECC & SDP

2.4.6. Social Development Framework / IEC Framework

The Social Development Framework of Brittannika Golf Course, Inc. will be centered on the improvement of quality of life of directly and indirectly affected communities. It shall prioritize the development of employment and training; business development; infrastructure; health; education; and the environment as outputs, outcomes, and impacts of the proponent's strategic actions in the development of host and neighboring communities. To attain these desired conditions, the proponent will work hand-in-hand with the peoples' organizations, national and local government units, and non-government institutions who are known as advocators of genuine growth and development. The details of SDP can be seen in the framework presented in Table 77.

TABLE 2-77. SOCIAL DEVELOPMENT FRAMEWORK FOR THE PROPOSED BRITTANNIKA GOLF COURSE PROJECT

Concern	Responsible Community Member / Beneficiary	Government Agency / Non-government Agency and Services	Proponent	Indicative Timeline	Source of Fund
Employment and Livelihood	Barangay Kagawad for Economic & Livelihood ● Qualified project-affected men, women, youth, and elderly	● Municipal planning Office ● TESDA ● DOLE ● MSSDO	Community Relation Officer of Brittannika	● Pre-construction ● Construction ● Operation	Proponent/ LGU-IRA
Health and Safety	Barangay Kagawad for Health ● Project-Affected Families	● Municipal Health Office ● BHC ● BDRRMO ● MDRRMO	Community Relation Officer of Brittannika	● Pre-construction ● Construction ● Operation	Proponent/ LGU-IRA
Education and Recreation	Barangay Kagawad for Education and Tourism ● Project-Affected families	● DepEd ● DoT	Community Relation Officer of Brittannika	● Construction ● Operation	Proponent/ LGU-IRA

Environment and Sanitation	Barangay Kagawad for Environment ● Project-Affected Community	● MENRO ● MHO	Community Relation Officer of Brittannika	● Pre-construction ● Construction ● Operation	Proponent/ LGU-IRA
Peace and Order	Barangay Kagawad for Peace and Order Barangay Peace-Keeping Force/Tanod ● Project-Affected Community	● LGU ● PNP ● MDRRMO ● BDRRMO	Community Relation Officer of Brittannika	● Pre-construction ● Construction ● Operation	Proponent/ LGU-IRA

TABLE 7-78. IEC Framework

Target Sector Identified as Needing Project IEC	Major Topics of Concerning Relation to Project	IEC Scheme/ Strategy Methods	Information Medium	Indicative Timelines and Frequency	Indicative Cost
- Community (Youth, Women, Men Senior Citizen, Farmers) - Education sector - Health sector - Local Government - Business sector - Religious sector	Full Information about: - The EIA process - The Brittannika Golf Course Project - Benefits of the Project on their Sociocultural/economic and bio-physical environment - Consequential impact of the operation to residents of the community - Compliance with the ECC conditions - Social Development Projects	**Primer/ Brochure** This strategy is effective in explaining in detail the subject matter, done in a simplified manner and in the language of the people. This strategy likewise, uses illustrations to further clarify the components of the Project. a. The EIA process illustrated and simplified in local dialect of the affected community written in English and Cebuano, b. The Brittannika Golf Course Project:	- Print media - Mass media - Community Consultations	- Pre-Operation Phase - Construction/ Installation Phase - Commissioning and Dry-run Operation Phase - Operation Phase	P100,000.00

		This shall contain: - the project description, project time frame, project facilities, management of Social and Environmental impacts, potential project benefits a graphic illustration about the project. - the process of Environmental Impact Assessment, roles and responsibilities of stakeholders - The Social Development Plan - On the residents who will be affected by the project activities showing their right to complain for violations of ECC conditions.			

		Consultations These are face to face encounters where participants and facilitators of knowledge and skills develop strategies to respond to the needs of the communities in the context of what is appropriate for their capabilities and resources) Using the interpersonal approach, Brittannika Golf Course, Inc. will implement regular consultations with the barangays for an open dialogue on the issues, problems and concerns related to the implementation and sustainability of the project. Group discussions of the sectoral groups affected by the project activities, the legal processes with the application of priority job placement, and other benefits.			

		Preparation of IEC materials - Posters and Wall Comics - A graphic illustration of information on "What are being developed?" and the rationale of the project in the context of their experiences. **Stakeholders Consultation** Using the feed-back mechanism through information booths in the municipality and the concerned barangays. **Community Forum** This strategy enables the company to discuss the progress of the project with key-persons of the company/resource persons. This also encourages multi-			

		sectoral interest groups to ask questions. Establishment of open-line communication with the concerned barangays/ communities through the CRO, this will ensure prompt resolution of community concerns.			

3. ENVIRONMENTAL MANAGEMENT PLAN

This chapter contains the project's Impact Management Plan (IMP), which serves as an action plan for applying mitigation and enhancement concepts, strategies, and procedures targeted at reducing and/or eliminating the proposed project's possible environmental consequences.

The following table summarizes the assessed environmental consequences and suggested preventive, mitigation, and/or enhancement strategies for each environmental component during the project's pre-construction, construction, operation, and abandonment stages.

The goal of an Environmental Management Plan (EMP) is to develop measures that will:

- Reduce the negative effects on numerous environmental components that were discovered during the Environmental Impact Assessment.
- Conserve natural resources whenever possible.
- Save natural resources.
- Develop a plan to track the success or failure of environmental management measures so that, if necessary, management can be reoriented or modified. During the building of the project, appropriate planning and design criteria can be used to incorporate a range of environmental protection and enhancement strategies. Furthermore, to ensure proper execution, the project's cost estimates must include the resources required for mitigation/protection, enhancing measures, and monitoring.

During the construction, operation, and abandonment stages, mitigation measures are recommended for activities classified as environmental components.

TABLE 3-1. IMPACT MANAGEMENT PLAN

Project Phase/ Environmental Aspect	Potential Impact	Environmental Component Likely to be Affected	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Agreements
CONSTRUCTION PHASE						
Transportation/ Mobilization of Heavy Equipment	- Dust generation as a result of increased movement of heavy equipment on site and delivery of materials Health effects due to inhalation of dust by residents near road networks. Stress due to noise in nearest receptor (residential area), and workers Respiratory problems on dust generation as a result of increased movement of heavy equipment on site and in delivery of materials	- Air - People	Implement dust suppression techniques Cover trucks loads with spoils/filling materials when in transit, especially in areas where communities are situated. Water spraying of road surface, particularly in community areas, to minimize dust at least three times a day especially during dry season Provision of 20 kph speed limits in major roads and built-up areas Regular coordination with relevant government agencies (such as DPWH) and LGUs as to the activity. Proper scheduling of noisy activities during 8:00 AM to 5:00PM Provision of ear mufflers to all workers operating noisy equipment Regular spraying of water in active construction areas	Environmental and Safety affairs in-charge Contractor	Part of Construction Costs	Proponents and Contractor with approved Memorandum of Agreement

			Provision of health and safety programs			
Civil Works	- Generation of solid wastes	-Land -Water	Implementation of Solid Waste Management Plan Segregation at Source Installation of a Materials Recovery Facility Segregation of solid waste according to recyclable and non-recyclables Hauling of discarded/recyclable items by DENR-Registered transporters	Environmental and Safety affairs in-charge Contractor	Part of Construction Costs	Proponents and Contractor with approved Memorandum of Agreement
	- Generation of Hazardous Wastes	-Land -Water	Segregation of hazardous wastes from regular wastes Storage of hazardous items on sealed, sturdy, and properly-marked containers Hauling of hazardous wastes by DENR-Accredited transporters and haulers	Environmental and Safety affairs in-charge Contractor	Part of Construction Costs	Proponents and Contractor with approved Memorandum of Agreement
	- Soil Erosion from Top Soil Elimination	-Land -Water	Conduct of earthworks during dry season to minimize possible erosion Implement progressive cleaning and earthworks moving to the remaining underdeveloped area to minimize erosion	Environmental and Safety affairs in-charge	Part of Construction Costs	Proponents and Contractor with approved Memorandum of Agreement

			Conduct immediate revegetation of appropriate erosion control grasses, especially native grasses such as carabao grass and talahib, to reduce rainfall impact to soil that can cause soil erosion during wet season Proper road construction technique such as adhering to engineering best practices (i.e. proper gradient, proper slope stabilization) Provision of proper and adequate drainage system. Progressive ground preparation and clearing will be conducted to minimize total area of land that will be disturbed at any one time, where practical. Construction plan will be programmed consistent with this principle. Maintenance of riparian buffers.			
	- Contamination of soil due to increased rate of erosion as a result of earth moving, excavation, tunnelling, and	Land	Proper road construction technique such as adhering to engineering best practices	Environmental and Safety affairs in-charge	Part of Construction Costs	Proponents and Contractor with approved Memorandum of Agreements

	generation and presence of topsoil.		Provision of proper and adequate drainage system. Progressive ground preparation and clearing will be conducted to minimize total area of land that will be disturbed at any one time, where practical. Construction plan will be programmed consistent with this principle.			
	- Contamination of water quality due to sedimentation/ siltation - Vegetation removal and loss of habitat	Water	Implementation of proper engineering control designs and measures for potential erosion and siltation. Install siltation traps within the drainage design to collect silt and sediments ensuring that they do not end up in adjacent aquatic areas. Maintain a vegetation buffer around natural and aquatic environments to reduce the sediment loading to waterways. Trees that can be affected during grading and shaping can be minimized by incorporating the existing trees with the landscape design of the project.	Environmental and Safety affairs in-charge	Part of Construction Costs	Proponents and Contractor with approved Memorandum of Agreement

			Tree cutting-permit from DENR will be secured prior to tree-cutting. Conditions of the said permit shall be complied by the proponent.			
	- Dust generation as a result of increased movement of heavy equipment on site and delivery of materials. - Health effects due to inhalation of dust by residents near road networks.	-Air -People	Implement dust suppression techniques. Cover trucks loaded with spoils/filling materials when in transit, especially in areas where communities are situated. Provision of speed limits in major roads and built-up areas. Avoid long exposure of excavated soil to rain and strong winds. Establishment of construction buffer zones and containment barriers.	Environmental and Safety affairs in-charge	Part of Construction Costs	Proponents and Contractor with approved Memorandum of Agreement
	- Increase in air emission levels - Increase in noise levels	-Air -People	Proper and regular maintenance of heavy equipment Installation of mufflers Perform noise generating activities during daytime	Environmental and Safety affairs in-charge	Part of Construction Costs	Proponents and Contractor with approved Memorandum of Agreement
	- Occupational health hazards and risk of workers and community	People	All personnel shall be required to wear proper PPE Conduct of safety orientation and training	Environmental and Safety affairs in-charge	Part of Construction Costs	Proponents and Contractor with approved Memorandum of Agreement

			Implementation of proper housekeeping Develop and implement safety and health program for workers and impact communities All civil and electro-mechanical works shall be supervised by trained engineers. First aid-stations, safety equipment and signage shall be made available on working areas.			
	+ Generation of employment + Creation of additional sources of income and livelihood	People	Prioritize hiring of qualified residents of the host communities Conduct specialized training program for the host communities	Environmental and Safety affairs in-charge	Part of Construction Costs	Proponents and Contractor with approved Memorandum of Agreement
	- Road accidents and traffic congestion	People	Regular maintenance of equipment and motor vehicles Conduct of road safety orientation and training Creation of road safety and management plan Impose speed Restrictions Assistance to the LGU on traffic management			
OPERATION PHASE						
Maintenance of Golf Course	- Solid waste generation	-Land -Water	Implementation of Solid Waste Management Plan	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC

			Segregation at Source. Segregation of solid waste according to recyclable and non-recyclables. Management and operation of materials recovery facility Collection and disposal of segregated solid waste.			
	- Change in soil quality/fertility	-Land -Water	The fertilizers to be used should only be specific substances approved by the Fertilizer and Pesticide Authority (FPA) of the Department of Agriculture. Use of controlled-release fertilizer to minimize the possible contamination of groundwater by nitrate Develop and implement a comprehensive Nutrient Management Program for the maintenance of course. Golf course maintenance staff should be trained in these best practices. Fertilizer applications should be based on the results of regular soil testing to avoid over application of nutrients.	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC

			Irrigate after fertilization to reduce volatization. Establish 'no-spray' zones and buffer areas particularly around areas where there are water features and other surface waters. Staff should be trained to identify and operate with care in these areas; Native species, especially those with deep rooting systems should be planted in these areas as a natural means of groundwater attenuation; Determine pest thresholds and apply pesticides only when threshold has been exceeded Follow recommended mowing schedules and technique to maintain a healthy pest resistant turf, and therefore reduce the amount of pesticides required. Develop and follow an Integrated Pest Management Policy. This policy should include the times for treating pests and other turf problems. This should also include recommendations for mowing time, and also indicate how to use			

			non-chemical options for pest control. Ensure proper handling, management and storage of fertilizers and pesticides to avoid spills. If practicable, weeding control shall be done manually.			
	- Possible contamination of soil and groundwater due to excess fertilizers and pesticides	-Land	Use of controlled-release fertilizer to minimize the possible contamination of groundwater by nitrate Fertilizer applications should be based on the results of regular soil testing to avoid over application of nutrients Follow recommended mowing schedules and technique to maintain a healthy pest resistant turf, and therefore reduce the amount of pesticides required Develop and follow an Integrated Pest Management Policy. This policy should include the times for treating pests and other turf problems. This should also include recommendations for mowing time, and also indicate how to use non-chemical options for pest control.			

			Ensure proper handling, management and storage of fertilizers and pesticides to avoid spills			
	- Vegetation removal	-Land	Prioritize native trees to be planted on buffer zones for erosion control	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC
	- Threat to abundance, frequency and distribution of important species	-Land	Secure Tree Cutting Permit from DENR Replacement of cut trees in a 1:100 ratio Prohibition of hunting and shall allow all wildlife to flee to suitable habitats in cases of sudden appearance	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC
	- Change in drainage pattern/inducement of flooding	-Water	Regular monitoring of rivers to ensure continuous flow of water. Drainage lines and canals shall be regularly checked for optimum efficiency.	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC
	-Depletion of water sources/Competition in water use	-Water	Regularly check the drainage lines to ensure that the runoffs from the golf course are impounded back to the lake or diverted to constructed irrigation canals. Ensure that company personnel operating the water supply equipment and devices are well trained and equipped with knowledge about the assigned tasks to ensure job efficiency.	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC

			Personnel in charge with the irrigation system, should regularly document the working condition of the facility to monitor its efficiency. In case one of the components failed, it should be reported immediately so proper corrective measures can be applied. Ensure that all water spraying equipment and/or system are properly calibrated. Checking and maintenance of sprinklers shall be done regularly to ensure that clogging is avoided and optimum efficiency is maintained. Ensure compliance with pertinent permits, such as the Water Permit from the National Water Regulatory Board (NWRB).			
	- Degradation of ground and surface water quality due to chemical/hazardous wastes spillage	-Water	Proper handling, management, transport and disposal of all identified fertilizers and pesticides and related hazardous materials and wastes. Hauling and disposal of hazardous wastes by DENR-Registered transporters and treaters.	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC

			Hazardous wastes shall be collected and stored separately from regular wastes. Stored hazardous wastes shall be adequately covered and properly marked based on specifications for easy identification during monitoring and hauling. Storage area shall be inspected and checked regularly for possible spillage. It shall be kept clean at all times.			
Daily Operations	- Solid waste generation	-Land	Implementation of Solid Waste Management Plan Waste segregation at source Trash bins within the golf course shall be regularly collected Ensure regular collection of wastes by municipal collectors	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC
	- Wastewater generation	-Water	Provision of appropriate sewage treatment facility	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC
	- Emission from Generator Sets, vehicles, and other diesel generating equipment	-Water	Regular maintenance of diesel generating equipment	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC
	- Traffic congestion during influx of tourists/visitors	-People	-Scheduled calendar implementation	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC

			-Rerouting of visitors to alternate project entrances			
	- Increase in demand for health services in the area - Threat to health due to generation/dispersion of dust	-People	Provision of clinics to immediately respond to minor health care needs of the tourists/visitors/ employees Hiring of health personnel to attend to those who need medical assistance Provision of fast moving vehicles to transport tourists/visitors/ employees who need urgent hospital needs.	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC
Operation of Standby Generator Set	- Emission from genset, vehicles and other diesel generating equipment and noise generation	-Air -People	Turn Off Engine while Parked" sign shall be posted at the parking area. Regular maintenance of generator set and diesel operated equipment. Ensure that appropriate control facilities are installed and being used to reduce emission and help reduce the noise. Proper maintenance and use of muffler	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC
Operation of Office and Club House	- Solid Waste Generation	-Land	Implementation of the Solid Waste Management Plan Segregation at source	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC

			Segregation of solid waste according to recyclable and non-recyclables Management and operation of materials recovery facility Collection and disposal of segregated solid waste			
	- Generation of domestic waste water	-Water	Installation of STP	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC
	- Generation of hazardous waste	-Land -Water	All hazardous waste to be stored in the MRF, the same will be disposed through DENR Accredited TSD	Environmental and Safety affairs in-charge	Part of Operation Costs	Proponents EMP and ECC
DECOMMISSIONING PHASE						
Clearing of facilities	- Removal of buildings and other structures - Transportation of materials	-Land	Occupational health and safety practices will be implemented during the clearing of facilities. Usage of PPE on all responsible personnel. Facilities will be placed on flat stable areas to avoid disassembled materials from falling/rolling and be obstruction from other clearing activities Possible MOA on third party assisting hauler on disassembled facilities will be done Observance of possible leakages of hazardous wastes and prepare	Proponent and Contractor	To be determined	Abandonment Plan, Proponents and Contractor with approved Memorandum of Agreements

			safety containers for proper disposal A storage facility must be provided before the start of decommissioning and abandonment phases to secure the materials and prevent possible hazards on storage.			
	- Generation of Dust	-Air	Watering of exposed ground shall be done to minimize dust generation	Proponent and Contractor	To be determined	Abandonment Plan, Proponents and Contractor with approved Memorandum of Agreements
	- Disposal of inert waste	-Land -Air -Water	Site selection: Avoid environmentally sensitive or unstable areas that cannot provide safe, long-term waste disposal (Minimum distance of 200 feet to nearest surface water, underlain by loamy, silty, or clayey soils, and maximum site slope of 9%) Crushing large concrete or brick structure into road base materials Recovering steel structural members or special metals for metal recycling Wood materials will be used for heating purposes or shredded to reduce volume and	Proponent and Contractor	To be determined	Abandonment Plan, Proponents and Contractor with approved Memorandum of Agreements

			provide mulching material			
	- Disposal of Hazardous and special waste	-Land -Water	- Ensure that all hazardous materials are transported and disposed DENR accredited transporter and treater. Provision of a safe storage area while still not hauled.	Proponent and Contractor	To be determined	Abandonment Plan, Proponents and Contractor with approved Memorandum of Agreements
	- Spills or releases during decommissioning	-Land -Water	A storage facility must be provided before the start of decommissioning and abandonment phases to secure the materials and prevent possible hazards on storage. Checking of possible sources of spills during transport and clearing of facilities and equipment. If identified, provide collection storage bottles with proper labels and identification. Include disposal during hauling.	Proponent and Contractor	To be determined	Abandonment Plan, Proponents and Contractor with approved Memorandum of Agreements
ABANDONMENT PHASE						
Cease of operation	- Possible contamination of soil and water	-Land -Water	Abandonment management plan will be prepared and carried out that will ensure proper handling, management, storage, transport, and disposal of hazardous materials and/or wastes. Ensure that all hazardous materials are	Proponent and Contractor	To be determined	Abandonment Plan, Proponents and Contractor with approved Memorandum of Agreements

			transported and disposed DENR accredited transporter and treater. Properly provide abandonment information to relevant agencies.			
	- Generation of dust	-Air	Watering of exposed ground shall be done to minimize dust generation	Proponent and Contractor	To be determined	Abandonment Plan, Proponents and Contractor with approved Memorandum of Agreements
	- Termination of workers	-People	Advance notice shall be given to workers	Proponent and Human Resources Unit	To be determined	Proponent

4. ENVIRONMENTAL RISK ASSESSMENT (ERA) & EMERGENCY RESPONSE POLICY GUIDELINES

This document assesses the risks associated with Brittannika Golf Course. An Environmental Risk Assessment (ERA) is an assessment tool for a project or activity that determines the level of risk it poses to people, property, and the environment. This assessment addresses issues pertaining to the 18-hole golf course, clubhouse, and villas in order to protect its members, employees, public, and the environment.

The method is used to systematically assess and organize data, information, assumptions, and uncertainties to better understand and forecast links between stressors and ecological impacts in a way that can be utilized to make environmental decisions.

There are several issues that will arise as a result of the proposed project, these have been divided into the construction phase and operational phase impacts and are discussed and assessed in detail below:

4.1 ASSESSMENT METHODOLOGY

Annex 2-7e of DAO 2003-30 contains the fundamental recommendations and outline for preparing an Environmental Risk Assessment (ERA). The guidelines, on the other hand, were primarily concerned with the risks and hazards posed by activities and/or industrial procedures involving chemical storage, processing, and usage. Although this is relevant to the proposed project, it should only be considered as part of the broader ERA. The geological hazards posed by the proposed Project were identified as major environmental risks.

4.1.1 Risk Screening Level

A risk screening level exercise refers to specific facilities or the use of certain procedures that have the potential to endanger people and the environment. As shown in **Table 4-1**, the Project is covered by the risk screening level exercise.

Natural, man-made, or a combination of both dangers are present in the proposed Project. Natural hazards include natural disasters such as earthquakes, geological instability, and typhoons. Accidents, such as fires, structural/equipment failure, chemical spillages, and human mistakes, are all examples of man-made risks. Man-made risks may be exacerbated as a direct result of natural hazards.

TABLE 4-1. RISK SCREENING MATRIX

Activities Requiring Risk Screening Exercise[1]	ERA Applicability to the Project
1) Facilities for the production or processing of organic/inorganic chemicals using: Alkylation, Amination, Carbonylation, Condensation, Dehydrogenation, Esterification, Halogenation, Hydrogenation, Hydrolysis, Oxidation, Polymerization, Sulphonation, Desulphurization, Nitration, Phosphorus prod., Distillation Extraction Solvation Pesticides & pharmaceutical prod.	Not Applicable
2) Installations for distillation, refining, and other processing petroleum products	Not Applicable
3) Installations for total or partial disposal of solid or liquid substances by incineration or chemical decomposition	Not Applicable
4) Installations for the production or processing of energy gases (e.g., LPG, LNG, SNG.)	Not Applicable
5) Installations for the dry distillation of coal or lignite	Not Applicable
6) Installations for the production of metals and non-metals by wet process or electrical energy	Not Applicable
Installations for the loading and unloading of hazardous materials as defined by RA 6969 (or DAO 29)	Not Applicable
CONCLUSION	**Risk screening level exercise is not applicable**

The proposed golf course project does not fall within all identified activities requiring a risk screening exercise, according to Table 4-1 of the Risk Screening Matrix provided under Annex 7-2e of DAO 2003-30 or the Revised Procedural Manual, and thus does not require the preparation of an Environmental Risk Assessment.

4.1.2 Evaluating the significance of impacts

A standard rating scale has been defined and will be used to analyze and quantify the detected impacts to ensure a direct comparison across identified problems. This is necessary because there are a variety of characteristics to consider while assessing consequences.

Five factors need to be considered when assessing the significance of impacts, namely:

1. **Relationship of the impact to temporal scales** - The temporal scale indicates the duration of the impact by defining the relevance of the impact at various time scales.

2. **Relationship of the impact to spatial scales** - the spatial scale defines the physical extent of the impact.

3. **The severity of the impact** - The severity/benefit scale is used to assess how severe negative impacts would be, as well as how beneficial positive impacts would be, on a specific afflicted system (for ecological impacts) or a specific affected party. The severity of impacts can be assessed both with and without mitigation to show how significant the impact is when nothing is done. The term "mitigation" encompasses not only "compensation," but also "containment" and "remedy." When it comes to positive outcomes, optimization refers to anything that can improve them. Mitigation or optimization, on the other hand, must be practicable, technically feasible, and financially viable.

4. **Reversibility/Irreversibility of the Impact** - Whether the impact can be reverted to its previous state or if it will continue to degrade indefinitely.

5. **The likelihood of the impact occurring** - the likelihood of impacts taking place as a result of project actions differs between potential impacts. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

To establish the ***overall significance*** of an activity, each criterion is prioritized with scores provided as shown in Table 4-2. The criterion is then divided into two categories: the activity's effect and the likelihood of an impact. The total scores recorded for the effect and likelihood are then read off the matrix presented in Table 4-3, to determine the overall significance of the impact (Table 4-4). The overall significance is either negative or positive. The ***environmental significance*** scale attempts to assess the relevance of a certain impact. This assessment must be carried out in the proper context, as an influence can be either ecological or social or both. The importance of an impact is largely influenced by the values of the person making the decision. As a result, social impacts, in particular, must reflect the values of the affected society.

Negative consequences rated as **"VERY HIGH"** or **"HIGH"** in significance will be explored further to see how they can be mitigated or what alternative activities or mitigation measures can be undertaken. These effects may also aid decision-makers, for example, a large number of **HIGH** negative impacts may lead to a negative decision.

It is standard practice to investigate alternate activities and/or mitigation measures for impacts identified as having a negative impact of **"MODERATE"** significance. Following that, the most effective and practical mitigation strategies will be suggested.

No investigations or alternatives will be considered for impacts rated as **"LOW"** in significance. To guarantee that the impacts stay minor, possible management methods will be examined.

TABLE 4-2: RANKING OF EVALUATION CRITERIA

EFFECT	**Temporal scale**		**Score**
	Short Term	Less than 5 years	**1**
	Medium Term	Between 5 and 20 years	**2**
	Long Term	Between 20 and 40 years (a generation) and from a human 3 perspective almost permanent.	**3**
	Permanent	Over 40 years and resulting in a permanent and lasting change that will always be there	**4**
	Spatial Scale		
	Localized	At localized scale and a few hectares in extent	**1**
	Study Area	The proposed site and its immediate environs	**2**
	Regional	District and Provincial level	**3**
	National	Country	**3**
	International	Internationally	**4**
	*	**Severity**	
	Slight	Slight impacts on the affected system(s) or party(ies)	**1**
	Moderate	Moderate impacts on the affected system(s) or party(ies)	**2**
	Severe	Severe impacts on the affected system(s) or party(ies)	**3**
	Very Severe	Very severe change on the affected system(s) or party(ies)	**4**
		Benefit	
	Slight Beneficial	Slightly beneficial to the affected 1 system(s) or party(ies)	**-1**
	Moderate Beneficial	An impact of real benefit to the 2 affected system(s) or party(ies)	**-2**
	Beneficial	A substantial benefit to the 4 affected system(s) or party(ies)	**-3**
	Very Beneficial	A very substantial benefit to the 8 affected system(s) or party(ies)	**-4**
	Reversibility		
	Reversible without intervention		**1**
	Reversible through administrative controls		**2**
	Reversible through engineering controls		**3**
	Irreversible		**4**
LIKELIHOOD	**Likelihood**		
	Unlikely	The likelihood of these impacts occurring is slight	**1**
	May Occur	The likelihood of these impacts occurring is possible	**2**
	Probable	The likelihood of these impacts occurring is probable	**3**
	Definite	The likelihood is that this impact will definitely occur	**4**

* *In certain cases it may not be possible to determine the severity of an impact thus it may be determined:* ***Don't know/Can't know***

TABLE 4-3: MATRIX USED FOR THE IMPACTS AND THEIR LIKELIHOOD OF OCCURRENCE

LIKELIHOOD		3	4	5	6	7	8	9	10	11	12	13	14	15	16
	1	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	2	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	3	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	4	7	8	9	10	11	12	13	14	15	16	17	18	19	20

TABLE 4-4: RANKING MATRIX ON ENVIRONMENTAL SIGNIFICANCE

Environmental Significance		
LOW	An acceptable impact for which mitigation is desirable but not essential; The impact by itself is insufficient even in combination with other low impacts to prevent the development. These impacts will result in either positive or negative medium to short term effects on the social and/or natural environment.	4-7
MODERATE	An important impact that requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in either positive or negative medium to long-term effects on the social and/or natural environment.	8-11
HIGH	A serious impact that, if not mitigated, may prevent the implementation of the project. These impacts would be considered by society as constituting a major and usually long-term change to the (natural and/or social) environment and result in severe effects or beneficial effects.	12-15
VERY HIGH	A very serious impact may be sufficient by itself to prevent the implementation of the project. The impact may result in permanent change. Very often these impacts are unmitigable and usually result in very severe effects, or very beneficial effects.	16-20

The environmental significance scale attempts to assess the relevance of a certain influence. This assessment must be carried out in the proper context, as an influence can be either ecological or social or both. The importance of an impact is largely influenced by the values of the person making the decision. As a result, social impacts, in particular, must reflect the values of the affected society.

Cumulative Impacts

Cumulative impacts have an effect on an impact's relevance rating since they incorporate both on-site and off-site sources. The noise generated by an activity (on-site) may, for example, result in a value that falls under the NPCC Noise Standards for residential areas. Noise levels in the surrounding area may also be within NPCC Noise Standards due to activities in the vicinity. The total noise level at the given receptor may exceed the NPCC Noise Standards if both on-site and off-site activities occur at the same time. As a result, it's critical to think about repercussions in terms of their cumulative nature.

Seasonality

Although seasonality is not taken into account in the significance ranking, it may have an impact on the evaluation at different periods of the year. Seasonality will only have an impact on particular impacts, thus it will only be taken into account for those, and management actions will be done accordingly (i.e. dust suppression measures being implemented during the dry season).

Prioritizing

The above-mentioned impact evaluation is used to determine which impacts require mitigating strategies. Negative impacts that are rated as **"VERY HIGH"** or **"HIGH"** in importance will be looked into further to see how they can be mitigated or what alternative activities or mitigation measures can be implemented. These effects may also aid decision-makers, for example, a large number of **HIGH** negative impacts may lead to a negative decision. It is usual practice to seek substitute activities and/or mitigation actions for impacts identified as having a negative impact of **"MODERATE"** significance. Following that, the most effective and practical mitigation strategies will be suggested. No investigations or alternatives will be considered for impacts rated as **"LOW"** in importance. To guarantee that the impacts stay minor, possible management methods will be examined.

4.2 IMPACTS THAT MAY RESULT FROM THE CONSTRUCTION PHASE

4.2.1 Impacts on geology and topography

Cause and Comment:

Excavations will be required in order to lay appropriate foundations for the clubhouse. Minor excavations will also be needed for the development of the road network and the installation of services.

Significance statement:

Only minimal topographical changes to the property are expected to be necessary to enable the development's construction. Topographical manipulation will be required just in a few spots, not across the entire site. Furthermore, because significant portions of the land are relatively flat, topographic impacts on the area are believed to have a low negative impact. This impact has no mitigation measures in place. There are presently no topographic implications associated with the no-go option.

TABLE 4-5. IMPACTS ON GEOLOGY AND TOPOGRAPHY

Impact	Effect				Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility		
Without mitigation	Long-term	Localized	Slight	Reversible	Unlikely	**LOW -**
With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**
	No-Go					
Without mitigation		N/A	N/A	N/A	N/A	**N/A**
With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**

4.2.2 Impacts on Traffic

Cause and Comment

Large construction vehicles will use the existing road network during the construction phase. This may cause traffic congestion, particularly at peak hours, as well as damage to the current gravel road.

Significance statement:

Because construction traffic will only use existing roads in the short term, i.e. for the duration of the construction phase, the impact is assessed to be moderately negative. However, if the suggested mitigation actions are followed, the impact could be minimized to a negligible level.

Mitigation measures recommended to reduce the impact are as follows:

- Construction vehicles should not utilize any existing road infrastructure during peak traffic periods.
- The developer must ensure that the standard of the road remains at an acceptable level during the construction phase, and if not must repair the road at their own cost.
- The contractor must make adequate provision for safety signage, red flags, and other appropriate measures to increase the safety of other road users.

For the no-go option, no construction is anticipated, and therefore no construction vehicles will utilize the road network.

TABLE 4-6. IMPACTS ON TRAFFIC

Impact	Effect				Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility		
Without mitigation	Short-term	Localized	Slight	Reversible	Definite	**MODERATE -**
With mitigation	Short-term	Localized	Slight	Reversible	Unlikely	**LOW -**
	No-Go					
Without mitigation		N/A	N/A	N/A	N/A	**N/A**
With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**

4.2.3 Impacts on Health and Safety

Cause and Comment

Health and safety aspects will mostly pertain to activities defined under the RA 11058 of 2018 or the Occupational Safety and Health Standard Act.

Significance statement

Health and safety impacts will be short-term, i.e. during the construction phase, and are well-regulated by the OSHS Act, hence the impact is deemed to be of low negative significance. However, if the suggested mitigation measures are followed, the impact could be reduced even further.

Mitigation measures recommended to reduce the impact are as follows:

- For the length of the construction phase, adequate toilet facilities must be built and kept in excellent working order on the construction site. When the construction is finished, the toilets should be removed from the site. Waste must be disposed of at a licensed disposal facility.
- During the building period, construction workers must have access to adequate clean drinking water at all times.
- All necessary cooking activities must be conducted in a designated space for construction workers. The location must be chosen to eliminate the risk of fire. It's a good idea to make sure there are little gas cookers on hand.

For the no-go option, no construction is anticipated, and therefore no impacts will take place.

TABLE 4-7. IMPACTS ON HEALTH AND SAFETY

Impact	Effect				Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility		
Without mitigation	Short-term	Localized	Slight	Reversible	Unlikely	**LOW -**
With mitigation	Short-term	Localized	Slight	Reversible	Unlikely	**LOW -**
	No-Go					
Without mitigation		N/A	N/A	N/A	N/A	**N/A**

With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**

4.2.4 Impacts on Biodiversity

4.2.4.1 Impacts on ecological processes

Cause and comment

During the EIA's scoping phase, there was concern expressed about the project's potential impact on ecological systems. Fragmentation, isolation, and vegetation clearing may all disrupt ecological systems. This results in a decrease or cessation of succession, as well as a reduction in ecological zones and habitats, resulting in an increase in alien vegetation. This may be limited when viewed separately on the site. When taken as a whole, however, it may be harmful to individual species or communities.

Significance statement

The development risks fragmenting vulnerable ecosystems if mitigation measures are not implemented. This will result in fewer ecological zones and habitats, which could lead to an invasion of invasive alien species.

If the mitigating actions are adopted throughout the project's operational phase, the outcome will be medium-term and of moderate importance.

When compared to the condition without mitigation measures, the impact of the no-go option is significant, as large areas have been cleared for cultivation.

In order to manage and mitigate this potential impact, the following strategies are proposed:

- It is necessary to identify and preserve vegetation/ecological corridors.
- Wherever possible, animal paths must be created and maintained.
- Greens, tee boxes, fairways, and landscaping around the clubhouse should all be planted with native species that have characteristics similar to those found in the existing veld types; and
    - Grasses that are native to the area should be used on greens, tee boxes, and fairways to avoid invasive species.

With respect to the no-go option, the impact is severe as the area was cleared for agricultural purposes and now consists of weedy species on the fallow land.

TABLE 4-8. IMPACTS ON ECOLOGICAL PROCESSES

Impact	Effect				Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility		
Without mitigation	Long-term	Localized	Severe	Irreversible	Definite	**VERY HIGH -**
With mitigation	Long-term	Localized	Slight	Reversible through Engineering Controls	Unlikely	**MODERATE -**
	No-Go					
Without mitigation	Long-term	Localized	Severe	Irreversible	Definite	**VERY HIGH -**
With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**

4.2.4.2 Removal of topsoil and soil erosion

Cause and comment

In order to reshape and build a golf course, large amounts of soil must be moved and bulk earthworks must be performed. In order to achieve final levels, a cut-to-fill method is commonly used, in which some areas are excavated and others are filled in. Excavation of areas necessitates the removal of vegetation as well as the removal of topsoil layers and, in many cases, sub-topsoil layers. Soil erosion can be caused by the removal of topsoil and bulk earthworks.

Significance statement

Without mitigation, the area's soil structure will be harmed and possibly jeopardized in the long run. The impact will be moderate and localized, and the likelihood of such an impact is high.

If mitigation measures are implemented (such as stockpiling all vegetation stripped, for example), the effects will be long-term, localized, and of moderate impact.

Mitigation and management measures to reduce impacts include the following:

- All vegetation removed from construction areas should be stockpiled with the intention of converting it to mulch and reintroducing it to the areas where it was removed.
- At a minimum depth of 300mm, all topsoil should be stockpiled and replaced as a final graded layer over the subsoil contouring.
- The new course contouring should help disperse water run-off rather than concentrating it and increasing erosion risk; and
- To reduce water run-off speed, the new course vertical profile should be gentler towards peripheral rough areas.
- Disturbed areas should be rehabilitated as soon as construction has been completed. Rehabilitation should be undertaken progressively.

- Control the amount of runoff crossing exposed areas by using berms or temporary or permanent drainage ditches to divert water flow around the cleared areas.
- The final route alignment of the road network should be carefully planned. Proper location and construction of the road will minimize impacts. Locate roads on ridgelines, allowing water to drain naturally downhill.
- The access road should be designed no wider than necessary to accommodate the immediate anticipated use.
- Drainage lines should be kept in a natural state as far as possible.
- Minimize the alteration to topography.
- Minimize the area of impervious surfaces.
- Grade impervious surfaces to drain into vegetated areas.
- Ensure fine materials being transported are covered with tarps or equivalent material.

For the no-go option, the impact is low, as currently the riverbank is exposed and eroded in areas.

TABLE 4-9. IMPACTS ON EROSION

Impact	Effect				Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility		
Without mitigation	Long-term	Localized	Severe	Irreversible	Unlikely	**VERY HIGH -**
With mitigation	Long-term	Localized	Moderate	Irreversible	Probable	**MODERATE -**
	No-Go					
Without mitigation	Long-term	Localized	Moderate	Irreversible	Definite	**LOW -**
With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**

4.2.5 Impacts on Air Quality

Cause and comment

Impacts on air quality during the construction phase will primarily be as a result of increased dust levels associated with the required excavation, vegetation clearing, grading, and other construction activities. This also includes dust created by large construction vehicles utilizing the existing gravel road.

Significance statement

It is probable that dust will be created during the construction phase of the development, however, this will be in the short term and limited to the construction phase. If the various mitigation measures below are implemented this impact could be reduced to a low negative significance.

Mitigation measures recommended to reduce the impact are as follows:

- The best method of controlling dust is to prevent dust production. This can best be accomplished by limiting the amount of bare soil exposed at one time.
- Minimize the total amount of bare soil exposed to erosive forces by (1) controlling the amount of ground that is cleared at one time in preparation for construction, and (2) limiting the amount of time that bare ground may remain exposed before rehabilitation measures are put into place.
- The clearing and grading of the site should be planned so as to minimize the exposure time of the soil. If possible, activities should be undertaken in a phased manner instead of disturbing the entire site at one time.
- Dust control mechanisms should be employed on exposed soils. These may include wetting of exposed soils or protecting exposed soils with coarse granular materials, mulches or straw. Take note that exotic vegetation that has been cleared may not be used for this purpose.
- In addition to other dust control techniques, wind barriers should be installed, if deemed necessary, to protect exposed soils. A wind barrier generally protects soil downwind for a distance of 10 times the height of the barrier.
- Once disturbance of the site has been completed, the soil surface should be stabilized/covered with permanent revegetation techniques or temporary mulch techniques
- Plan for the worst case, that is for heavy rainfall and runoff events or high winds.
- Minimize the amount of ground disturbance occurring when the potential for wind erosion is highest. No grading or leveling should be conducted during high wind conditions.
- Ensure that all construction equipment and vehicles are maintained in good working order.
- If required, wet the gravel access road during windy periods when construction vehicle traffic is high

TABLE 4-10. IMPACTS ON AIR QUALITY

Impact	Effect				Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility		
Without mitigation	Short-term	Localized	Slight	Reversible	Probable	**MODERATE -**
With mitigation	Short-term	Localized	Slight	Reversible	May occur	**LOW -**
	No-Go					
Without mitigation	N/A	N/A	N/A	N/A	N/A	**No Impact**
With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**

4.2.6 Noise Impacts

Cause and comment

It is anticipated that there will be an increase in noise levels during the construction phase of the development which will be associated with the operation of construction vehicles and equipment.

Significance statement

There is a strong possibility that the development will create excessive noise during the construction phase. This impact is considered to be short term and can be minimized by various mitigation measures listed below. If mitigation is enforced the impact could be reduced to a low significance.

Mitigation measures recommended to reduce the impact are as follows:

- All activities with high noise levels should be restricted to daylight hours. Heavy equipment must only be used during weekdays and between the hours of 7 am and 6 pm.
- No noise-generating activities should be undertaken over weekends and public holidays.
- Equipment and construction vehicles must be kept in sound working order at all times, and comply with the stipulated maximum sound level of 8 decibels.

TABLE 4-11. NOISE IMPACTS

Impact	Effect				Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility		
Without mitigation	Short-term	Localized	Slight	Reversible	Probable	**MODERATE -**
With mitigation	Short-term	Localized	Slight	Reversible	May occur	**LOW -**
	No-Go					
Without mitigation	Currently, no noise-generating activities on site	N/A	N/A	N/A	N/A	**No Impact**
With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**

4.2.7 Surface and Groundwater Pollution

Cause and comment

Various substances may result in the pollution of surface and groundwater sources. Construction activities may lead to sediment being deposited into drainage lines and the nearest water bodies, namely Cabizares Creek and Lian River; pollution from litter

and general construction wastes due to improper site management. Washing down of vehicles and equipment may result in the pollution of drainage areas and stormwater systems, and pollution may occur from poor vehicle maintenance and improper storage of hazardous materials such as fuel, etc.

Significance statement

There is a strong possibility that the development will create pollution during the construction phase. This impact is considered to be short-term and can be minimized by various mitigation measures as included below. If mitigation is enforced the impact could be reduced to a low significance.

Mitigation measures recommended to reduce the impact are as follows:

- No rock, silt, cement, grout, asphalt, petroleum product, timber, vegetation, domestic waste, or any deleterious substance should be placed or allowed to disperse into any drainage line and/or the nearest water bodies.
- Ensure that all construction equipment and vehicles are free of leaks from oil, fuel, or hydraulic fuels. No construction vehicles should be cleaned on the development site.
- Concrete should not be mixed directly on the soil surface.
- Avoid surfacing the road in wet weather or when rain is forecast before the surfacing will have time to set.
- Keep materials out of the rain to control runoff contamination at the source.
- Designate a contained area for vehicle parking, vehicle refueling, and routine equipment maintenance. The designated areas should be away from drainage lines or stormwater inlets. The area should be bermed if necessary.
- Major equipment or vehicle repairs should be conducted away from the construction site.
- Keep pollutants off exposed areas. Place dustbins and recycling receptacles around the site to minimize litter.
- A solid waste control program should be implemented during the construction phase to ensure that litter is contained on-site. Litter should be disposed of at a registered waste disposal site.
- Clean up leaks, drips, and other spills immediately to prevent contamination.
- Mud and sediment should not be allowed to be transported off-site on connecting roads.
- Never wash down "dirty" pavement or impermeable surfaces. Use dry clean-up methods (sweeping, absorbent materials, etc.) whenever possible. If water must be used, collect the runoff water and dispose of the water in a suitable manner.
- Well yields of shallow wells around the project site are being monitored.]

TABLE 4-12. IMPACTS ON WATER QUALITY

Impact	Effect				Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility		
Without mitigation	Long-term	Regional	Severe	Irreversible	Definite	**HIGH -**
With mitigation	Long-term	Localized	Slight	Reversible through Engineering Control	May occur	**LOW -**
	No-Go					
Without mitigation	N/A	N/A	N/A	N/A	N/A	**No Impact**
With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**

4.2.8 Impacts on Water Courses

Cause and comment

The effects of large-scale bulk earthworks have an overall effect on water penetration rates and surface run-off speeds. The presence of grasses with developed and knitted thatch reduces the rate of water penetration into the soil, as well as increases the speed of surface run-off. This in turn raises surface water volume discharge rates into watercourses resulting in potentially increased erosion. Higher water speeds further increase the potential to wash away shallow-rooted species and undermine riparian systems.

Significance statement

Without appropriate mitigation measures as proposed below, the development runs the risk of potentially damaging the watercourses, which will result in short-term, local scale, severe effects.

Several mitigation measures relating to the fairways parking areas are proposed. Implementing such measures during the construction phase will result in a medium-term improvement of possible impacts on the watercourses, and will result in a slight impact if implemented correctly during the construction phase.

The following mitigation and management measures are proposed to reduce possible impacts:

- Fairways and driving ranges should be kept as comfortably narrow as possible so as to reduce the scale of knitted thatch;
- Rough areas should be wider especially on the downward side of the slope so as to assist in reducing surface run-off speeds;
- Rough areas should attempt to retain and attenuate surface run-off where possible;

- Irrigation application rates should be carefully controlled and managed;
- Parking areas should make use of attenuation areas and erosion control methods at discharge points;
- Operational management programs to keep the nearest water bodies clean and clear of rubbish should be implemented; lastly
- The developer should attempt to use organic fertilizers as far as reasonably possible in order to ensure that pollutants do not run off into major river streams.

TABLE 4-13. IMPACTS ON WATER COURSES

Impact	Effect				Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility		
Without mitigation	Medium-term	Regional	Severe	Reversible	Probable	**HIGH -**
With mitigation	Short-term	Localized	Slight	Reversible	Unlikely	**LOW -**
	No-Go					
Without mitigation	N/A	N/A	N/A		N/A	**No Impact**
With mitigation	N/A	N/A	N/A		N/A	**N/A**

4.3 IMPACTS THAT MAY RESULT FROM THE OPERATIONAL PHASE

4.3.1 Loss of agricultural land

Cause and comment

The proposed development site is currently zoned as agricultural land. The proposed development will therefore result in a loss of agricultural potential.

Significance statement

The project area consists of high potential arable land. The loss of land for agricultural activities will be permanent and severe and therefore will result in a high impact. This impact cannot be mitigated.

The no-go option results in a low positive impact as although the area is zoned for agriculture it is not currently utilized for this purpose.

TABLE 4-14. IMPACTS ON LOSS OF AGRICULTURAL LAND

Impact	Effect				Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility		
Without mitigation	Permanent	Local	Severe	Irreversible	Definite	**HIGH -**
With mitigation	N/A	N/A	N/A	N/A	N/A	**No Impact**
	No-Go					

Without mitigation	Long-term	Local	Slight	Irreversible	Definite	**LOW +**
With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**

4.3.2 Surface and Groundwater Pollution

Cause and comment

During the operational phase, surface and groundwater pollution may occur as a result of improper waste management (i.e. litter from the people utilizing the golf course), discharge from the sewage treatment systems, and the use of pesticides and fertilizers for maintaining the fairways and greens.

Further, excessive application of these fertilizers may result in nitrate leaching, leading to increased nitrate levels in groundwater that exceed the drinking water standards. Excessive use of phosphorus-containing fertilizers, on the other hand, may also lead to eutrophication of surface water, wherein aquatic plant species, algae, and weeds grow quickly, decreasing the amount of dissolved oxygen available to aquatic life.

Spillage of pesticides, chemicals, fuels, and other hazardous materials or wastes due to transport, handling, and/or storage errors may result in soil, surface water, and groundwater contamination, and may endanger the health of the personnel on-site.

Furthermore, groundwater depletion due to over-extraction, may cause land subsidence, decrease in well output, or drying up of wells.

Significance statement

There is a strong possibility that the development will create pollution during the operational phase. This impact is considered to be permanent if not mitigated. If mitigation is enforced the impact could be reduced to a low significance.

The following mitigation and management measures are proposed to reduce possible impacts:

- A waste control program should be implemented during the operational phase to ensure that litter is contained on-site.
- Litter should be disposed of at a registered waste disposal site.
- Reduce the potential for pollution from fertilizer, herbicide, and pesticide applications. The proposed golf course should be encouraged to follow the following recommendations:
    - Organic fertilizer, pesticides, and herbicides must be used as far as possible. When the application of inorganic fertilizer, pesticides, or herbicides is unavoidable, a nutrient management plan should be in place prior to application.
    - Read the label before purchasing and applying the products.
    - Do not apply pesticides when rain is imminent. Pesticides need time to dry and work.

- Do not spray products during high wind conditions.
- Use the correct amount of water. Overwatering may result in leaching. Apply correct quantities/concentrations. Too little may not work and too much may cause damage to the environment.
- Use Integrated Pest Management to control pests.
- Select products with a low leaching potential.
- Where possible, use low toxicity, short-lived chemicals instead of high toxicity, long-lived chemicals.
- Use care when handling chemicals and disposing of the leftover material.

- Slow-release fertilizers are used for a more regulated nitrogen release, leading to longer residuals;
- Appropriate fertilizer application time;
- When choosing the correct amount of fertilizer, take into account grass species, growth stage, and other factors;
- Well-trained personnel who understand the turf's fertilizer requirements and the proper quantity of irrigation to apply for better nutrient absorption;
- Perforated pipes were constructed for efficient runoff control and monitoring.;
- Installation of liners to artificial lakes;
- Ponding of golf course drainage water to enable soil particles to settle at the bottom before discharging water, particularly during the rainy season. In manmade lakes, keep an eye on the nitrate concentration of the water.
- Washing water should not be allowed to disperse directly into natural drainage lines.
- Only use DENR-approved hazardous waste transport, storage, and treatment companies.
- Employees handling hazardous products and wastes should receive adequate training.
- Vehicle and equipment maintenance on a regular basis;
- Chemical Storage and handling facilities are available.
- Monitoring of groundwater use;
- To enhance efficiency, implement water conservation methods such as water reuse, utilizing rainfall for irrigation, and regular irrigation facility maintenance.

TABLE 4-15 SURFACE AND GROUNDWATER POLLUTION IMPACTS

Impact	Effect		

	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility	Risk or Likelihood	Overall Significance
Without mitigation	Long-term	Regional	Severe	Irreversible	Definite	**HIGH -**
With mitigation	Long-term	Localized	Slight	Reversible through Engineering Controls	May occur	**LOW -**
	No-Go					
Without mitigation	There are currently no activities on site	N/A	N/A	N/A	N/A	**No Impact**
With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**

4.3.3 Socio-economic Impacts

Cause and comment

The proposed development will create various employment opportunities. The proposed development would therefore indirectly result in the supply of much-needed housing facilities in the area. Furthermore, a scenic golf course in the area may attract tourists.

Significance statement

Employment opportunities provided during the operational phase of the development will be limited, however, if you include the possibility of attracting tourists and making more land available for housing projects, this will result in an impact of moderate positive significance. If the developer plans to initiate a trust for the upliftment of the community, this impact could be increased to a high positive impact.

For the no-go option, there is limited socio-economic value arising from a small farming enterprise, and the impact is regarded as low positive.

TABLE 4-16 SOCIO-ECONOMIC IMPACTS

Impact	Effect				Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility		
Without mitigation	Long-term	Localized	Beneficial	Reversible	Probable	**MODERATE +**
With mitigation	Long-term	Localized	Beneficial	Reversible	Probable	**HIGH +**
	No-Go					
Without mitigation	Long-term	Localized	Slight	Reversible	Probable	**LOW +**
With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**

4.3.4 Traffic Impacts

4.3.4.1 Increase in Traffic Volumes

Cause and comment

During the operational phase of the golf course, it is anticipated that the traffic volumes will increase. The new golf course can be expected to generate an average of 180 vehicle trips (1 trip direction) on the three busiest days each week (Wednesday, Thursdays and Saturdays) with fewer trips on the remaining days. Based on the anticipated daily traffic volumes, the road can be categorized as a medium to a high volume gravel road.

Significance statement

Without mitigation, the road will be in a poor condition, which will have a direct effect on the increased traffic volumes and vehicle safety, resulting in an overall high significance. If the road is maintained during the operational phase by the developer the road will be able to withstand the increased traffic volumes.

The following mitigation and management measures are proposed to reduce possible impacts:

- The development should contribute towards maintenance required to ensure that the road remains in a suitable condition after construction has been completed.
- A general 20km/h speed limit should be posted together with recommended speeds at sharp curves. After construction is complete, the road surface should be re-graveled and compacted to ensure that the riding quality of the road remains at least at a similar standard after development than it currently is.
- Given that the traffic volumes are likely to increase substantially as a result of the proposed golf course, the developer should also perhaps contribute towards annual maintenance of the road in order to ensure that it remains in a good condition.
- At current, no protection is afforded to those road users who may lose control of vehicles at culverts and at embankments of Prk Cabatuan - Pag-asa Road. Guardrails should be provided at these locations in order to improve the safety of the road.
- Crossings must be clearly demarcated by means of advance warning signage.
- Bush clearing should be conducted where vegetation encroaches onto the road surface in order to improve sight distances and ensure that motorists in opposing directions are able to pass each other.

For the no-go option, the impact is moderate-low, as there are currently numerous vehicles utilizing this road.

TABLE 4-17 INCREASE IN TRAFFIC VOLUMES

Impact	Effect				Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility		
Without mitigation	Long-term	Localized	Severe	Reversible	Definite	**HIGH -**

With mitigation	Long-term	Localized	Slight	Reversible	Probable	**MODERATE -**
	No-Go					
Without mitigation	Long-term	Localized	Slight	Reversible	Probable	**MODERATE -**
With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**

4.3.4.2 Increased Accidents

Cause and comment

During the operational phase of the golf course and especially during dry periods, dust may reduce visibility on Prk Cabatuan - Pag-asa Road. Furthermore, various sections of the road appear to have clayey material which may lead to slippery road surfaces during wet conditions. As it is anticipated that with traffic volumes increasing, the risk of a vehicle accident is likely to increase. The main concern from a traffic safety perspective is also the lack of road signage along the entire length of the Prk Cabatuan - Pag-asa Road. Of particular concern is the lack of advance warning of sharp curves and the poor sight distance on the approaches to these curves. While vehicle operating speeds can be relatively high along with the majority of the length of the road given long straight sections, problems can occur at curves due to lack of advance warning and as a result of visibility being impaired by dust.

Significance statement

It is highly likely that vehicular accidents along this road may increase if adequate mitigation measures are not implemented. However, should these mitigation measures be implemented the risk of accidents can be reduced to a low significance.

The mitigation and management measures are as proposed above.

For the no-go option, the impact is moderate-low, as there are currently numerous vehicles utilizing this road.

TABLE 4-18 INCREASED ACCIDENTS

Impact	Effect				Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility		
Without mitigation	Long-term	Localized	Severe	Irreversible	Definite	**HIGH -**
With mitigation	Long-term	Localized	Slight	Irreversible	May occur	**LOW -**
	No-Go					
Without mitigation	Long-term	Localized	Slight	Irreversible	Probable	**MODERATE -**
With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**

4.3.4.3 Increased Dust

Cause and comment

Dust created by an increase in traffic on Prk Cabatuan - Pag-asa Road may reduce the visibility of motorists. Dust will be prevalent for a few days after the road is bladed as during the blading process, fine material from the road edge is worked into the road surface. However, the dust will generally dissipate after a few days. It is also noted that the higher the speed of vehicles, the more dust will be created. Speed limits of 20km/h would result in less dust.

Significance statement

It is highly likely that vehicular accidents along this road may increase due to reduced visibility resulting from increased dust levels. Large amounts of dust may also result in health risks to both humans and livestock in the area if adequate mitigation measures as recommended by the Traffic Impact Assessment are not implemented. However, should these be implemented the risk of accidents can be reduced to a moderate significance.

The following mitigation and management measures, in addition to those presented above, are proposed to reduce possible impacts:

- It is proposed that a speed limit of 20 km/h be imposed on the Prk Cabatuan - Pag-asa Road.

TABLE 4-19 INCREASED DUST

Impact	Effect				Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility		
Without mitigation	Long-term	Localized	Severe	Reversible	Definite	**HIGH -**
With mitigation	Long-term	Localized	Slight	Reversible	Probable	**MODERATE -**
	No-Go					
Without mitigation	Long-term	Localized	Slight	Reversible	Probable	**MODERATE -**
With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**

4.3.4.4 Increased Noise

Cause and comment

During the operational phase golf course, it is anticipated that the traffic volumes will increase. This will result in an increase in the noise levels generated from the road.

Significance statement

Speeding along Prk Cabatuan - Pag-asa Road may increase noise levels from vehicular traffic significantly. If adequate speed limits are imposed, noise levels may decrease. However, the overall increase in traffic will still result in an increase in noise levels and therefore the impact is only reduced to moderate significance.

The following mitigation and management measures are proposed to reduce possible impacts:

- The Prk Cabatuan - Pag-asa Road should be placed with a 20km/h sign. This will result in a decrease in possible noise emanating from the increased traffic volume.

TABLE 4-20 INCREASED NOISE

Impact	Effect				Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact	Reversibility		
Without mitigation	Long-term	Localized	Severe	Reversible	Probable	**MODERATE -**
With mitigation	Long-term	Localized	Slight	Reversible	Probable	**MODERATE -**
No-Go						
Without mitigation	Long-term	Localized	Slight	Reversible	Probable	**MODERATE -**
With mitigation	N/A	N/A	N/A	N/A	N/A	**N/A**

4.4 EMERGENCY RESPONSE POLICY AND GUIDELINES

4.4.1. Objectives

Through the effective and efficient execution of the Emergency Response Plan (ERP), the main goal is to ensure the protection and preservation of life, property, and the environment in the event of disasters such as typhoons, earthquakes, volcanic eruptions, flash floods, and man-made disasters such as land, air, and sea disasters.

The mandate of an ERP is to make use of the combined resources created or available at the site and/or off-site services to achieve the following:

- To minimize the detrimental effects of a disaster on people and property;
- Provide rescue assistance and medical treatment to persons who have been injured on and off the golf course;
- Keep local/state emergency relief officials informed and coordinate with them;
- Initially contain and ultimately bring the disaster under control;
- Preserve relevant records and equipment for subsequent inquiry into the causes and circumstances leading to the disastrous happenings; and

- Investigate and take steps to prevent the recurrence of similar incidents.

As a result, the ERP must be linked to the identification of potential sources of hazards as well as the maximum loss scenario that can occur in the affected area.

4.4.2. Emergency Response Policy

The Project is dedicated to ensuring the health, safety, and security of its employees, assets, and the environment by preventing accidents by removing potential threats/hazards, and anticipating other likely causes. As a result, the Project will follow the fundamental strategy to emergency response, which is to avoid situations that could lead to an emergency.

The Project will appoint a safety officer who will conduct regular safety briefings and emergency response drills on a regular basis. The safety officer will be in charge of ensuring that operations and maintenance processes are carried out safely on a daily basis. The safety officer will inspect the work and crew situation to ensure that safety regulations are followed.

Aside from workplace mishaps, the project region is also vulnerable to geologic risks such as ground shaking, surface rupturing, and typhoons.

Table 4-21 lists the various occurrences and emergency circumstances that may arise during the proposed Project's future operation.

TABLE 4-21. EMERGENCY SCENARIOS FOR THE PROJECT

Type of emergency situation	Possible causes	Potential effects
Occupational safety accidents	• Improper training and supervision of personnel • Equipment or facility failure • A complete lack of comprehension of the surrounding environment	• Inquiries and fatalities to personnel • Equipment loss, whether partial or complete
Earthquakes	• Movement/rupture of nearby fault lines	• Structural failure

	● Volcanic eruption	● Injuries and fatalities to personnel and communities
Flooding	● Unpredictable weather	● Structural collapse ● Destruction of project facilities ● Injuries and fatalities to personnel and communities

Here are all the Project's basic safety rules, which will be improved during construction, to limit, if not eliminate, extreme emergency scenarios that result in loss of life and property.

4.4.3. Emergency Plan

The organization will implement an Emergency Management Plan based on the Philippine National Disaster Risk Reduction Management (NDRRMC) and Office of Civil Defense's (OCD) recommended framework. Emergency management can be divided into four categories: prevention, preparedness, response, and recovery.

Figure 4-1 Illustrates the four elements.

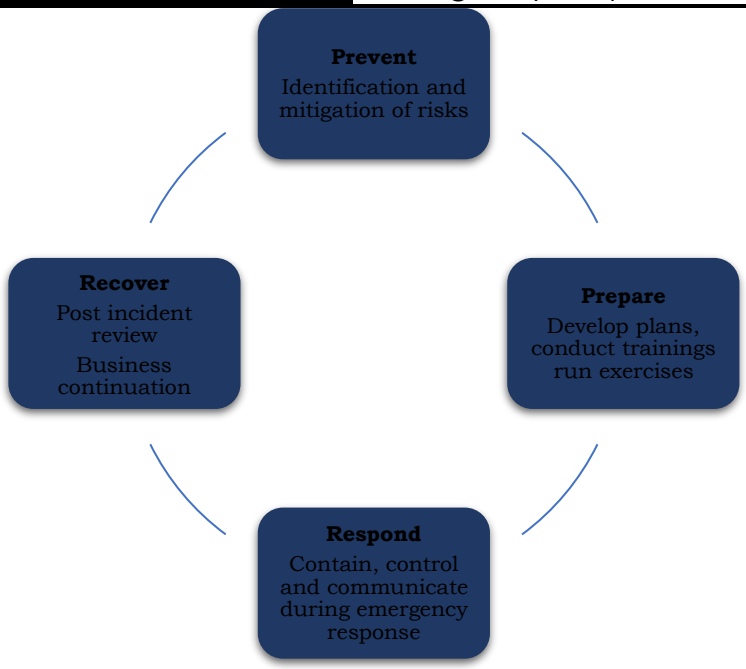


FIGURE 4-1. ELEMENTS OF EMERGENCY MANAGEMENT

4.4.4. Generic guidelines for the prevention, alleviation or response to emergency situations

4.4.4.1. Safety

1. All construction personnel, staff, and crew will receive thorough training, as well as regular toolbox and safety meetings, in order to fully comprehend and internalize the job/tasks assigned, as well as the associated risks and hazards, and the appropriate safety procedures.

2. Wearing suitable personal protection equipment is necessary for all personnel involved.

3. In the event of a typhoon or other severe weather, no work will be permitted.

4. The Safety Officer and his or her supervisors for each phase/work sector must check and monitor other personnel's adherence to the safety rules and plan on a regular basis.

5. Safety guidelines and procedures set by relevant agencies, such as the OHSC-DOLE, must be strictly followed.

4.4.4.2 Emergency procedure

The company General Manager and/or Construction Manager (or the highest-ranking official on-site accessible) will implement the Emergency Management Plan in the case of an emergency, along with the Safety Officer and the rest of the Emergency Response Team (ERT). As an Incident Commander (IC), the highest-

ranking official on-site assumes the position of the General Manager. Depending on the severity and type of the emergency, the IC will activate the ERT.

TABLE 4-22. KEY PERSONNEL IN EMERGENCY RESPONSE OPERATIONS

Emergency response personnel	Roles and responsibilities
Incident Commander	● In control of all operations in the case of an emergency ● Provides direction and orders to the response team in managing the emergency ● Reports the occurrence to the supervisor or project manager
Supervisor	● Assists on-site when needed ● Determine the health of those involved in the incident, assess the situation, and, if necessary, issue orders to the First Aid Team ● Notify affected families, including information on the hospital's location and other pertinent information
Safety Supervisors	● Oversees daily operations and maintenance processes for safety, including emergency response procedures
Liaison Officer	● Obtains all required permits and training certifications for personnel.
First Aid Team	● During an emergency, performs the actual response, rescue, and retrieval of individuals and equipment ● Requests an ambulance or needed specialists to aid the case as soon as possible when necessary, or arranges for the case to be forwarded to a better-equipped hospital if needed equipment is not available in the area
Logistics team	● Provides the First Aid Team with the required supplies and equipment ● Assists the First Aid team with additional support and assistance

5. SOCIAL DEVELOPMENT PLAN AND IEC FRAMEWORK

5.1 Social Development Plan

Social development planning is key in program and strategy formulation that is essential in mitigating impacts of this project. This serves as a framework to be followed by the proponent in preventing/mitigating and/or upgrading a project's negative and positive impacts on the people's livelihood, health, and environment.

The goal of the SDP (Social Development Plan) is to evaluate and pinpoint the primary communities that will be affected by the project. The SDP should follow the Municipal and Barangay Development Plans of the host communities and following the mandated Corporate Social Responsibility with the goal to create unity between the Project Proponent, community institutions, and stakeholders, prompting a better life for community members.

Listed below are the issues included in the perception survey that were taken into account and addressed in the creation of the SDP.

Livelihood

1. Insufficiency of livelihood programs for those within the marginalized in the community.

Environment

2. Water resource destruction and harm.
3. Dust coming from the site of the project
4. Dust coming from dump trucks

Social

5. Provision of documents and updates on the progress of the project to the municipal office
6. Community IEC and consultation

Health

7. Dust generated from the operation of dump trucks that may cause a negative impact on the health of residents
8. Dust dispersed that may pose threat to human health.
9. Not enough medical facilities and tools

Basic Services

10. Water supply depletion or loss
11. Insufficient water supply
12. Some households still do not have access to proper toilets

Disaster Preparedness

13. Scarcity of disaster-response facilities (larger evacuation center)

14. Scarcity of disaster-response equipment (ambulance and fire truck)
15. Scarcity of disaster-response
16. Employee safety during landslides

Table 5-3 presents the major programs and activities in the Social Development Plan (SDP).

As an outcome of the EIA, the SDP is impact-based. It is rationalized within the scope of the PEISS, addressing all potential socioeconomic consequences that may occur during and after project operation as a result of major technical effects. The SDP will be implemented by the company's professional Community Development or Social Work Officer in collaboration with all stakeholders. In collaboration with other stakeholders, SDP initiatives and activities will be monitored and evaluated on a regular basis.

Furthermore, cooperation with the project-affected barangay and the Municipal LGU of Tupi will be carried out to ensure that project operations are in line with the local government's development priorities.

The SDP, as a framework plan, will consist of an indicative set of initiatives.

- Determine the primary issues that must be addressed (including those of the second level scoping issues and concerns);
- Recommend and create methods to address these problems;
- Indicate the agency or entity in charge of the measures; and
- Make timetables for implementing these initiatives.

Manpower Requirement

The following jobs will be created as a result of the golf course development at various phases of implementation.

TABLE 5-1. MANPOWER REQUIREMENT DURING CONSTRUCTION PHASE

Construction Phase	Manpower Requirement
Survey	5
Earthmoving	6
Shaping	25
Civil Works	25
Material Processing	14

Lake Liner	14
Irrigation	5
Management Office	6
Total	**100**

During the building phase, the proponent will use 90% local skilled employees. The proponent will train local personnel to meet a minimum of 70% of the manpower requirements shown in Table 5-2 during the Operations Phase.

TABLE 5-2. MANPOWER REQUIREMENT DURING OPERATION PHASE

Operation Phase	Manpower Requirement
Golf Course Maintenance	**27**
Superentendent	1
Lead Man	4
Operators	5
Technician	5
Utilities	12
Clubhouse	**48**
Office	8
Waiters/waitresses	12
Bartenders	4
Front Desk	3
Security Guards	7
Technicians	5
Golf Caddies	5
Utilities	4
Total	**75**

TABLE 5-3. SOCIAL DEVELOPMENT PLAN

Concern	Program Actions	Lead Organization	Responsible Community Member/Beneficiary	Indicative Timeline	Source of Fund/Indicative Cost
1. Economic empowerment/ Employment	• Establish barangay employment/business services offices • Conduct seminar and educational tour on sustainable fishing, agroforestry, and organic farming: - Pro-poor Livelihood programs - Program for the elderly - Technical skills for women • Women's livelihood and economic development initiatives, as well as initiatives for the	Brittannika Golf Course Inc., DA, BFAR, TESDA, MSWD, Women's Concerns LGU Officer	• Barangay Communities • Communities located within impact barangay • Impact barangay POs and NGOs	Pre-construction Construction Operation	Brittannika Golf Course Inc. Php 25,000.00

	elderly and out-of-school children - Piggery and poultry - Handicraft training/seminar - Backyard Gardening ● Gender Responsive ● Construction work training ● Caddies training ● Food preparation and etc. training				
2. Health	● Establishment of a community health program in project-affected localities, as well as frequent monitoring and counseling on medical services ● IEC on sanitation and provision of	Brittannika Golf Course Inc. DOH, DepEd, Municipal Health Officer	● Barangay Committee Health, Barangay Health Workers ● Residents affected by the project	Pre-construction Construction Operation	Brittannika Golf Course Inc. Php 35,000.00

	toilet building supplies to households who do not have toilets • Health Education and Sanitation Program (Quarterly) • Employee health and safety training • Maternal and Child Health Care at Health Centers or Hospitals: Prenatal, Intranatal, Postnatal, Childbirth • Nutritional Programs: Feeding Supplemental Feeding Programs in schools • Health Care that prioritizes non-company personnel in health		• POs and NGOs within impact barangay • Project employees • Barangay Nutrition scholars and Health • Workers; Women and children in affected barangays		

	centers and hospitals.				
3.Hazard and disaster preparedness	• Disaster Risk Management Plan • IEC on Disaster Risk Management • Trainings and seminars for local residents and workers of Brittannika Golf Course on Disaster Risk Preparedness and Mitigation • Provide equipment and aid in response and recovery of affected communities. • Provision of support for Brittannika Golf Course employees and community during emergency and disaster situations.	Brittannika Golf Course Inc. in partnership with local authorities and community organizations	• Communities of impact barangays • Brittannika Golf Course employees	Pre-construction Construction Operation	Brittannika Golf Course Inc. Php 30,000.00

	• Adhering to various local, national and international rules and protocols during epidemics, pandemics, disasters, and the like. • Adherence to proper sanitation and health protocols.				
4. Transportation	• Road improvements • Constant and frequent sprinkling of unpaved roads (if there is any)	Brittannika Golf Course in partnership with local authorities and community organizations	• Barangay Committees • Communities within impact barangay • POs and NGOs within affected barangays	Pre-construction Construction Operation	Brittannika Golf Course Inc. Php 70,000.00
5. Peace and Order	• Conduct seminars and workshops • Provide equipment and facilities to aid	Brittannika Golf Course, PNP, Barangay	• Barangay Committees • Communities within	Pre-construction Construction	Brittannika Golf Course Inc. Php 25,000.00

	the peace and order in the community	Tanod (LGU)	impact barangay • POs and NGOs within affected barangays	Operation	

5.2 Information, Education and Communication Framework

A comprehensive and intensive Information Education and Communication (IEC) Campaign is designed to provide communities and the general public with better information and education about the project's objectives, necessity, and benefits, as well as the processes, through the distribution and posting of written materials such as brochures, newsletters, media statements and articles, bulletins, posters, comics, and online presence. Non-written types include fora, symposia, conferences, workshops, community discussions and hearings, interpersonal focus talks, house-to-house and purok-to-purok information drives, an information desk/center, community seminars, site visits, and an audio campaign. The IEC materials and activities will also serve as a forum for ongoing conversation, feedback, and a check-and-balance mechanism for involved parties.

Table 5-4 indicates the IEC Plan for the Golf Course Project.

5.2.1. Complaints and Management

Brittannika Golf Course has Complaints Management Guidelines in place to ensure that complaints from any interested party (i.e. stakeholders, employees, customers, community, government agencies/offices, and other related entities who wants to express their discontent with the effects of the company's operations) are handled properly. Below, the summary of the Complaints Management Guidelines of Brittannika Golf Course is indicated.

5.2.1.1. Responsibilities and Authorities

Legal Assistant - is in charge of documenting received complaints in the complaints blotter (logbook), including the complainant's information, complaint details, source, date, and time.

Grievance Committee - is a group of Division/Department Managers and a Legal Assistant who are in charge of responding to, investigating, and validating complaints.

Concerned Department (Process Owner) - is in charge of initiating and implementing immediate/corrective measures, as well as ensuring the uniformity of actions deployed.

5.2.1.2 Receiving a Complaint

Complaints can be made verbally or in writing at any of the following locations:

- At Brittannika Golf Course
- Via any Brittannika Golf Course office
- Via any of Brittannika Golf Course's advertised email address
- Via Brittannika Golf Course Facebook page

Personal data is gathered, kept, utilized, and disclosed. Any information sent outside the firm without the complainant's agreement may be a violation of information privacy.

Privacy Statement:

"Brittannika Golf Course is collecting your personal information in order to respond to your complaint. Unless necessary or allowed by law, your information will not be shared to a third party without your consent."

5.2.1.3 Recording of a Complaint

The Legal Assistant is in charge of keeping records. All concerns must be documented in the Complaints Blotter. They are kept and destroyed in accordance with an approved retention and disposal plan. Records/files containing confidential, sensitive, and/or personal information must be kept within the recordkeeping system using suitable security classifications and access restrictions.

5.2.1.4 Assessing a Complaint

When a complaint is received, it is evaluated to determine:

- if it will be managed under this method;
- whether it will be accepted; and
- how, where, and by whom it should be managed.

The concerns mentioned, the relevant information supplied, the measures performed thus far, and the desired outcome must all be evaluated in order to comprehend the complaint from the complainant's point of view.

Furthermore, in order to identify how to handle the complaint, factors like the relevance of the issues, the reasoning for any previous decisions or actions, any relevant legislative, policy, or process requirements, the probable outcome or remedy, and also any potential remedial action or enhancement must be considered.

To guarantee that complaints are handled systematically and appropriately, the nature and implications of the issues stated must be assessed in order to determine the optimal classification of the complaint. The complaint categorization levels are as follows:

Typical Complaint - is assessed as having a low level of risk and/or a low degree of damage to the complainant or the institution. In most cases, these concerns require only a cursory inquiry.

Intermediate Complaint - a complaint with a medium degree of risk and/or a moderate amount of damage to the complainant or the institution. These concerns may need a thorough investigation and referral to senior/executive management.

Complex Complaint - a serious or major complaint with a high or extreme level of damage to the complainant or the institution. These concerns may necessitate a thorough investigation and the prompt attention of senior/executive management.

5.2.1.5 Investigating a Complaint

The following are the major steps in the investigative process:

- Determine the major problems;
- Determine the major problems;

- Determine whether or not there is a conflict of interest;
- Plan the investigation;
- Gather and assess evidences; and
- Make a conclusion.

5.2.1.6 Responding to and Reporting a Complaint

Following an investigation, timely and meaningful response must be given to the complainant and any relevant employees or business areas involved and/or that may be impacted by any results or remedial measures.

Complaints are classified and reported to senior management in a consistent and methodical manner.

TABLE 5-4. IEC FRAMEWORK

Sector identified as Needing Project IEC	Major Topic/s of Concern in relation to Project	IEC Scheme/ Strategy/ Methods	Information Medium	Indicative timelines and Frequency	Indicative Cost
Communities of impact barangay; Brittannika Golf Course Inc. employees, LGUs, POs, NGOs	Project details/background; - Proponent - Scope of the project - Schedule of activities - Project development - Benefits from the Project	•Conduct of Seminars, •Site visits, conference, forum and workshops, meetings with LGUs, Local newspaper, press releases, Leaflets, Billboards; • Distribution of info materials •Maintenance of Information desk and center	Print Media, Posters, brochures, Comics Multi-media press releases, broadcast, TV spots and social media	Pre-construction	Php 35,000.00
Communities of impact barangay; LGUs, POs,	EIA Results - Compliance with the DENR requirements	• Public Meetings • Purok-to-purok	Print Media, Posters, brochures, Comics	Pre-construction Construction Operation	Php 30,000.00

NGOs, Contractors	- Environmental Management Plan - Environmental Compliance and Monitoring - Environmental laws and related regulations on MMT, ECC, etc. - Clean-Air Act, Clean Water Act, Ecological Solid Waste Management Act and other laws and regulations.	information drive • Distribution of info materials • Maintenance of Information desk and center	Multi-media press releases, broadcast, TV spots and social media		

6. ENVIRONMENTAL COMPLIANCE MONITORING

As required under DENR Memorandum Circular 2010-14 and the Revised Procedural Manual for DAO 2003-30, the following section presents the environmental compliance monitoring plan for the project to monitor the identified key environmental impacts of the Project. This monitoring plan includes "Environmental Quality Performance Level" (EQPL) values, which are threshold/limit levels identified for each critical parameter associated with the identified significant project impacts. The limit level shall be the regulated threshold of pollutant (standard that must not be exceeded) while the action level is set lower than the limit level wherein management measures must be implemented so as not to reach the regulated threshold.

The following mechanisms and monitoring schemes are discussed in the succeeding subsections:

- Self-monitoring plan;
- Multi-sectoral Monitoring Framework; and
- Environmental Guarantee and Monitoring Fund/ Contingent Liability and Rehabilitation Fund Commitments

6.1 Self-Monitoring Plan

The proponent will undertake regular self-monitoring for parameters indicated in Table 6-1. A quarterly environmental monitoring report in the form of the Self-Monitoring Report (SMR) will be prepared by the proponent and submitted to the DENR-EMB accordingly.

TABLE 6-1 SELF-MONITORING PLAN

Key Environmental Aspect Per Project Phase	Potential Impacts	Parameters to be Monitored	Sampling and Measurement Plan			Lead Person	Estimated Cost	EQPL Management Schemes					
			Method	Frequency	Location			EQPL Range			Management Measures		
								Alert	Action	Limit	Alert	Action	Limit
CONSTRUCTION PHASE													
Land	• Vegetation removal/loss of habitat • Threat to existence and/or loss of important local species • Threat to abundance, frequency and distribution of important species	Species richness, abundance, diversity/evenness, dominance and presence of endemic and threatened species	Transect survey and netting	Annual	Direct impact areas and rehabilitated areas particularly reforestation/re-vegetated areas	PCO/Environmental Officer		10% decline in species richness and abundance	30% decline in baseline species richness and abundance	50% decline in baseline species richness and abundance	Investigate whether the decline is project related or non-project related	If project related then inform concerned department/ project management If not project related, then inform LGU and DENR	If project related, evaluate existing rehabilitation measures being implemented. Implement a more effective rehabilitation measure as necessary. If not project related, then inform LGU and DENR for proper action
Water/Land	Generation of Solid Waste	Solid wastes	Actual Monitoring Waste Collection and Segregation by the assigned personnel	Daily	Project site segregation/ Materials Recovery Facility (MRF)	Building Administrator/ PCO	Minimal	Build-up of waste materials	Noticeable odor and stacks of solid wastes	Foul odor and attraction of rodents, and insects	Ensure waste segregation and regular collection of wastes	Issue notice to employees/workers to implement further segregation of wastes Remind/coordinate with waste hauler to ensure regular	Intensify the waste segregation practice. Collection of segregated wastes shall be scheduled accordingly. Domestic wastes such as leftovers must be placed in covered bins or properly tied up

												hauling of wastes	garbage bags if not readily collected by contracted waste collectors. Dig compost pit for biodegradable wastes.
Water	Impairment of Surface and groundwater quality	Color	Grab sampling	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO	Based on prevailing rater Per lab analysis				Progressive clearing and earth moving/ conduct earth works during dry season if possible Provide temporary ditch or catchment to divert water pollutants from waterways		
		pH	In-situ	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO							
		Dissolved Oxygen	In-situ	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO							
		BOD	Grab sampling	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO							
		TSS	Grab sampling	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO							
		Temperature	In-situ	Quarterly	Clubhouse drainage /	PCO							

					lagoon/pool outfall								
		Phosphate	Grab sampling	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO							
		Nitrate	Grab sampling	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO							
		Chloride	Grab sampling	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO							
		Oil and Grease	Grab sampling	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO							
		Fecal Coliform	Grab sampling	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO							
Air	Emissions from construction equipment/vehicles/ generation of excessive dusts	TSP PM10	Hi-volume/gravimetric /AAS/ICP /UV-Vis 1-hour averaging	Annually	Baseline air quality monitoring stations (may be adjusted accordingly)	PCO	25000 /sampling	TSP: 161 ug/Ncm PM10: 105 ug/Ncm Complaints lodged by	TSP: 184 ug/Ncm PM10: 120 ug/Ncm Complaints lodged by community	TSP: 230 ug/Ncm PM10: 150 ug/Ncm	Regular monitoring of construction equipment Turn off engine while	Request for maintenance More stringent implementation of OSH Standards, traffic and parking policies	Request for maintenance, upgrade or replacement if possible

								community		Complaints lodged by community	parked policy		
People	Generation of Employment	Employment	Qualified locals	Entire operation stage		Admin/ HR/LGU	Minimal	Coordination with LGU			Coordination with LGU regarding the number of available jobs and respective requirements.		
OPERATION PHASE													
Water	Impairment of Surface and groundwater quality	Color	Grab sampling	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO	Color				Regular maintenance of water distribution system Intensify the implementation of IPM	Change/adjust fertilizer and pesticide requirement/ amount of application	Install liners to unlined artificial lakes/lagoons
		pH	In-situ	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO	pH						
		Dissolved Oxygen	In-situ	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO	Dissolved Oxygen						
		BOD	Grab sampling	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO	BOD						
		TSS	Grab sampling	Quarterly	Clubhouse drainage /	PCO	TSS						

					lagoon/pool outfall								
		Temperature	In-situ	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO	Temperature						
		Phosphate	Grab sampling	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO	Phosphate						
		Nitrate	Grab sampling	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO	Nitrate						
		Chloride	Grab sampling	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO	Chloride						
		Oil and Grease	Grab sampling	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO	Oil and Grease						
		Fecal Coliform	Grab sampling	Quarterly	Clubhouse drainage / lagoon/pool outfall	PCO	Fecal Coliform						
Water/Land	Generation of Solid Waste	Solid wastes	Actual Monitoring Waste Collection and Segregati	Daily	Project site segregation/ Materials Recovery	Building Administrator/ PCO	Minimal	Build-up of waste materials	Noticeable odor and stacks of solid wastes	Foul odor and attraction of rodents,	Ensure waste segregation and regular collection of wastes	Issue notice to employees/workers to implement further	Intensify the waste segregation practice. Collection of segregated wastes shall be

			on by the assigned personnel		Facility (MRF)					and insects		segregation of wastes Remind/coordinate with waste hauler to ensure regular hauling of wastes	scheduled accordingly. Domestic wastes such as leftovers must be placed in covered bins or properly tied up garbage bags if not readily collected by contracted waste collector. Dig compost pit for biodegradable wastes.
	Generation of Hazardous Wastes i.e. empty fertilizer bags, empty containers of spent chemicals and pesticides, used oil, used cooking oil, BFLs, WEEE, ULABS,	Hazardous wastes	Actual Monitoring Waste Collection and Segregation by the assigned competent personnel	Daily All hazardous wastes generated such as containers of fertilizers and pesticides, BFLs, used oil, ULABS, WEEE and trapped grease will be monitored monthly. A record of the	Hazardous waste storage area	Building Administrator/ PCO	25,000/year depending on the volume of waste generated and availability of hazwaste transporter and treater	Accumulation of hazardous wastes	Significant increase of wastes i.e. use up nearly 80% of the capacity of storage drums	Hazardous waste storage area can no longer accommodate the accumulated wastes	Properly label, segregate wastes according to GHS labeling standards	Accounting of used materials. Contact DENR accredited transporter and treater. Provide secondary containment for liquid wastes to avoid spillage	Immediately schedule transport and disposal of wastes using the online manifest system.

				daily generation will be maintained and updated regularly.									
Air	Emissions from gensets/vehicles/ generation of excessive dusts	TSP PM10 NOx CO	Hi-volume/gravimetric/AAS/ICP/UV-Vis 1-hour averaging	Annually	Genset stack	PCO	25000/sampling	TSP: 161 ug/Ncm PM10: 105 ug/Ncm NOx: 140 ppm CO:17,500ug/m3 Complaints lodged by community	TSP: 184 ug/Ncm PM10: 120 ug/Ncm NOx: 195ppm CO:26,250ug/m3 Complaints lodged by community	TSP: 230 ug/Ncm PM10: 150 ug/Ncm NOx: 260ppm CO: 35,500 ug.m3 Complaints lodged by community	Regular monitoring of construction equipment Turn off engine while parked policy	Request for maintenance More stringent implementation of OSH Standards, traffic and parking policies	Request for maintenance, upgrade or replacement if possible
Air/People	Health impacts from excessive pesticide spraying	Occupational health and hazards	Inspection of records of work related illnesses	Monthly reporting	Project area and households within the primary	PCO/Maintenance personnel/Company Nurse	Minimal	5 work-related illnesses in a month 1 valid complain	10 work-related illnesses in a month	15 work-related illnesses in a month	Use of PPE during pesticide spraying Adoption and impleme	PPE during pesticide spraying Adoption and implementation of an	If project related, halt pesticide application and reconsider alternative options.

					impact areas			t in a month	3 valid complaints in a month	5 valid complaints in a month	ntation of an integrated Pest Management Program Conduct investigation and safety re-training	integrated Pest Management Program Conduct investigation and safety re-training	
People	Generation of Employment	Employment	Qualified locals	Entire operation stage		Admin/ HR/LGU	Minimal	Coordination with LGU			Coordination with LGU regarding the number of available jobs and respective requirements.		

7. DECOMMISSIONING / ABANDONMENT / REHABILITATION POLICY

There are no intentions to leave the project area once it is completed, as it will be kept as economically and environmentally as possible. In the worst-case scenario, if the project is decommissioned or abandoned due to economic, financial, or any force majeure scenarios, the Proponent will guarantee that essential facilities that could represent possible environmental hazards are adequately handled and decommissioned.

The emptying of hazardous chemicals storage areas will be a priority facility that will be managed and decommissioned during unforeseen circumstances. The remaining fertilizers and pesticides will be sold to interested customers, such as agricultural businesses, or safely disposed of if there are no buyers.

In addition, if facilities within the Project area are removed, the proponent must ensure that the abandonment complies with all applicable national and local government rules and regulations. The Environmental Management Bureau will study and assess an Abandonment Plan that will be drafted and presented. The approved abandonment plan will be followed to ensure that any potential environmental risks and hazards are addressed.

The following sections address plans that the proponent will explore during the abandonment or decommissioning phase.

7.1. Social Plan

During the abandonment and decommissioning phase, the proponent will implement the following program for its regular employees in accordance with applicable labor laws, rules, and regulations.

- Retrenchment Package;
- Labor Support Policies and Programs;
- Job Search for employees;
- Skills Training and Education Programs;
- Enterprise Awareness and counseling.

7.1.1. Retrenchment Package

Existing laws, rules, and regulations, particularly the Labor Code, will be strictly applied to the parting package for all company employees. Aside from the perks that workers would receive during the shutdown, there will be additional incentives. This incentive is in addition to the standard legal and regulatory requirements. In collaboration with local government agencies, the company will also organize micro-business trainings and seminars for laborers and the community as part of its Corporate Social Responsibility programs. The trainings and seminars will be aimed at informing lower-level company employees as well as the impacted community about other possible economic and commercial options in the province or region.

7.1.2. Labor Support Policies and Programs

The company will provide a wide range of trainings to help employees boost their employment capacities. This will make it easier for employees to shift to new jobs or become self-employed. These services can be any of the following:

• *Job Search.* Workers are given information about the labor market and employment openings.

• *Skills Training and Education Programs.* Provision of job-related training or training geared toward a future employment, ranging from office skills to artisan multi-skills training;

• *Enterprise Awareness.* To encourage those who have considered self-employment but have yet to perceive it as a viable option; and

• *Counseling.* Workers should be focused on money matters and property management to assist them cope socially and financially after losing their job.

7.2. Decommissioning / Abandonment Criteria

Following the completion of the closure steps outlined in the preceding sections, quantifiable criteria must be established against which the plan's and implementation's effectiveness can be measured. These criteria will help the company determine when the closure standard attained is sufficient to ensure that any potential environmental impacts are mitigated.

Table 7-1 shows a generic criterion that can be used as a reference to monitor the plan's effectiveness.

TABLE 7-1. ABANDONMENT CRITERIA

Category	Closure criteria	Indicators	Reporting Requirements
Surface water	Compliance with the Clean Water Act	Records Water Quality Stations	Monitoring report
Air	Compliance with the standards of Clean Air Act	Records of Air Quality measurements for TSP	Monitoring report
Soil Quality	Free from chemical and/or hazardous substances contamination	Soil quality in clubhouse, hazardous waste storage facilities and in golf course site	Monitoring Report
Structural Safety / Stability	The site and facilities are safe for use by future stakeholders for similar uses or purposes	Structural assessment	Evidence of structural inspection and certification of

			building integrity and soundness

7.3. Details of Maintenance and Monitoring Plan

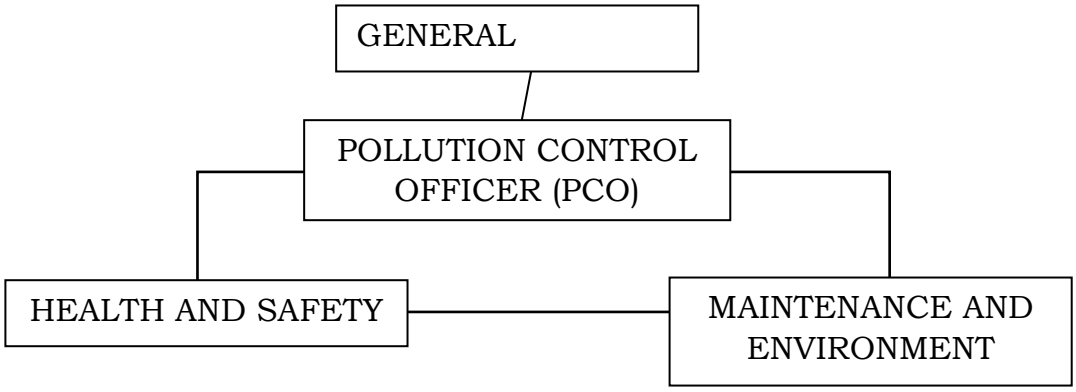
After the decommissioning and abandonment work is completed, a maintenance and monitoring program will be created to maintain the programs' continuation and effectiveness. After the abandonment period, maintenance and monitoring of any potential environmental impacts are expected to last for a year but may last longer based on monitoring findings against abandonment criteria.

It is likely that only a skeleton staff will be present on site during this time. A monitoring crew will visit the site at regular interval to take planned samples and examine the progress and effectiveness of the closure mechanisms in place, as well as determine whether any remedial work is required.

8. INSTITUTIONAL PLAN FOR EMP IMPLEMENTATION

The proponent shall organize an Environmental Unit (EU) to effectively perform the self-monitoring activities of the project. The EU shall report directly to the management on the status of EMP implementation and recommends mitigating measures when necessary. The EU shall be responsible for the compliance of the management plan.

FIGURE 8-1. ORGANIZATIONAL CHART



The implementation of the Environmental Management Plan (EMP) provided in this document will be specifically handled by the Pollution Control Officer (PCO). The proponent, through the said department, is committed to comply with the conditions that will be stipulated in the ECC and other related environmental laws.

The proponent will also establish a partnership with relevant government agencies, various stakeholders and local host communities in relation to the project. This partnership is necessary to maintain a transparent and positive relationship for the project and its stakeholders, as well as to ensure compliance with environmental protection and enhancement measures.

8.1. GRIEVANCE MECHANISM

Brittannika Golf Course will have its Complaints Management Guideline to ensure that complaints from any of the interested parties (i.e. stakeholders, employees, customer, community, government agencies/offices and other related entities who wish to express their dissatisfaction pertaining to the effects of the company's operations) are properly communicated and addressed.

8.1.1 RESPONSIBILITIES AND AUTHORITIES

Legal Assistant – is responsible in recording complaints received such as complainant's information, complaint's details, source, date, and time raised the complaints blotter. It is his/her responsibility to initially assess, notify the concerned

department, follow through actions taken, and monitor its effectiveness. Thereafter, closing of complaints once settled and safekeeping of records.

Grievance Committee – is a team of Division/Department managers and Legal Assistant who is responsible to respond, investigate, and validate complaints.

Concerned Department (Process Owner) – is responsible to initiate and implement immediate/corrective actions and ensures consistency of actions deployed.

8.1.2 RECEIVING A COMPLAINT

Complaints are received verbally or in writing at any of the following:

- Brittannika Golf Course Main Office
- Via any of Brittannika Golf Course's contact numbers, email address, and fax numbers
- Via Brittannika Golf Course's website or official page

Personal information are collected, stored, used and disclosed. Any information transferred outside the company without the consent of the complainant may be a breach of information privacy.

8.1.2.1 RECORDING A COMPLAINT

Recordkeeping is the responsibility of the Legal Assistant. All complaints received shall be recorded in the Complaints Blotter. They are retained and destroyed under an approved retention and disposal schedule. Records/files with confidential, sensitive and/or personal information must be saved within the recordkeeping system with appropriate security classifications and security access controls.

8.1.3 ASSESSING A COMPLAINT

After receiving a complaint, it is assessed to determine:

- If it will be managed under this procedure;
- It it will be accepted;
- How, where, and by whom it should be managed.

The issued raised, the relevant information provided, the actions undertaken so far and the outcome requested must be considered to understand the complaint based on the complainant's perspective.

In addition, to be able to determine how to manage the complaint, factors such as the significance of the issues, the reasoning for any decisions or actions made so far, any relevant legislative, policy or process requirements, the likely outcome or remedy and any potential corrective actions or improvement must be considered.

To ensure that complaints are managed consistently and appropriately, the nature and implication of the issues raised must be reviewed to determine the best classification of the complaint. Below are the classification levels of complaints:

TYPICAL COMPLAINT – assessed as having a low level or risk and/or minimal level of detriment to the complainant or to the company. These complaints normally involve minimal investigation

INTERMEDIATE COMPLAINT – assessed as having a medium level of risk and/or moderate level of detriment to the complainant or to the company. These complaints may involve detailed investigation and may require referral to the senior/executive management.

COMPLEX COMPLAINT – assessed as being serious or significant, with a high or extreme level of detriment to the complainant or to the company. These complaints may involve extensive investigation and require immediate attention of the senior/executive management.

8.1.4 INVESTIGATING A COMPLAINT

The key steps of the investigation process are the following:

- Identify the key issues;
- Assess if there is conflict of interest;
- Plan the investigation;
- Gather and evaluate evidences; and
- Make a decision.

8.1.5 RESPONDING TO AND REPORTING A COMPLAINT

Following an investigation, a timely and meaningful feedback must be provided to the complainant and any relevant staff or business areas involved and/or that might be affected by any findings or corrective actions.

Complaints are consistently and systematically categorized and reported to the top management.

X X X